

CLEAN AIR ACT AMENDMENTS OF 1989

HEARINGS
BEFORE THE
SUBCOMMITTEE ON
ENVIRONMENTAL PROTECTION
OF THE
COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE
ONE HUNDRED FIRST CONGRESS

FIRST SESSION

ON

S. 1630

A BILL TO AMEND THE CLEAN AIR ACT TO PROVIDE FOR ATTAINMENT
AND MAINTENANCE OF HEALTH PROTECTIVE NATIONAL AMBIENT
AIR QUALITY STANDARDS, AND FOR OTHER PURPOSES

SEPTEMBER 28, 1989

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CLEAN AIR ACT AMENDMENTS OF 1989

Nonattainment Issues (Mobile Sources)

THURSDAY, SEPTEMBER 28, 1989

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:12 a.m., in room 216, Hart Senate Office Building, Hon. Max Baucus (chairman of the subcommittee) presiding.

Present: Senators Baucus, Chafee, Lieberman, Durenberger, and Warner.

OPENING STATEMENT OF HON. MAX BAUCUS, U.S. SENATOR FROM THE STATE OF MONTANA

Senator BAUCUS. The hearing will come to order.

Yesterday I dispensed with an opening statement in the interest of time. I was inclined to do so again; however, I think the importance of motor vehicles and fuel quality to cleaner air cannot be overstated.

I expect the motor vehicle manufacturers represented here today will state that they have cut air emissions already—over 90 percent in some cases—since 1970. The 1970 standard was based on what we needed, not on what we knew how to do.

In 1970, there were no catalysts on cars and few catalysts on the drawing boards. And there is no question that the standards were both technology forcing at that time and clean air forcing.

To clean up each individual car does not tell the entire story. Since 1970, the number of vehicles registered in this country has increased 58 percent, and the number of vehicle miles traveled has increased 62 percent. So cleaner cars do not necessarily mean less pollution from mobile sources.

We also cannot rest on our laurels. Mobile sources are still half the problem in this country. We can choose to continue to reduce mobile source emissions, or we can take the more draconian step of dramatically reducing our reliance on the family car. I do not favor this latter alternative.

But to retain the use of our cars in the way we'd like to, we must continue to demand fewer emissions from each vehicle in order to offset growth. If this is done in concert with manufacturers of alternative or cleaner fuel, so much the better.

S. 1630 requires that motor vehicle manufacturers twice reduce emissions from vehicles. Some argue this is too expensive and too

extreme. Others, however, take a contrary view and say that these reductions are needed and, in fact, are cost effective. In fact, there probably is no other way we can get at the problem. If we do not continue to require lower reductions, our air quality will continue to deteriorate.

Cars today are certifying that they can meet the second round of tighter tailpipe standards at 50,000 miles. Certification is not in use, but in 14 years it seems to me that the auto industry, with its track record, can meet these standards for the full useful life of the vehicle.

Such innovation is also not a drain on our economy. Catalyst manufacturers, palladium miners—for example, in my State of Montana manufacturers of NO_x control technologies all make a living from cleaner air. Unfortunately, many of them do not feel at liberty to tell us how clean the air could be with our products, but they are providing jobs and paying taxes like any other industry. These companies are exporting American know-how to other countries. If we do not press hard to keep a lead in these and other technologies, we will have to import pollution control technologies. In some areas this has already begun, and there is no reason why pollution control cannot be an increasingly important part of our export portfolio.

We should be proud of our accomplishments, not hide from them. And I find it ironic that my confidence in American ingenuity seems to exceed that of America's industrial heartland. Revitalization of our industrial base can be helped, not hindered, if we see our air pollution crisis as an opportunity.

I welcome your comments and the comments of all the panelists this morning and this afternoon. I look forward to hearing what the witnesses can tell us about their plans to control air pollution.

Our first witness this morning is the Honorable Carl Levin from the State of Michigan.

But, before we begin, my very able ranking member, Senator Chafee, would like to make a statement.

OPENING STATEMENT OF HON. JOHN H. CHAFEE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator CHAFEE. Thank you, Mr. Chairman.

This is an extremely important line up of witnesses today because I am particularly interested in the carbon dioxide emissions. I am interested in the CO₂ emissions and the greenhouse effect.

Many of you may have seen an article on the front page of the Post just a few days ago, which talked about U.S. contribution to greenhouse effect rises—U.S. carbon dioxide emissions increasing. Carbon dioxide emissions have grown faster in the U.S. than in the rest of the world since 1986.

What we're talking about here is the whole global warming problem. I sincerely believe that the greatest international environmental challenge facing the world is two-fold: CFCs, which we're dealing with in other legislation, which, indeed, contribute to global warming; and carbon dioxide and other gases that contribute to the overall global warming. The CFCs deal principally with the destruction of the ozone layer.

So, therefore, I am extremely interested in hearing the testimony and hopefully being successful in pressing the automotive industry to increase the miles per gallon.

We have a report from OTA—and the witnesses that are here I hope will comment on that report—stating that technology now exists so that cars can reach 33 miles a gallon on average by 1995 without performance loss, and the legislation we have doesn't stop at 33 but goes to 35. We believe, and hopefully will receive some confirmation on that, or some explanation and assistance on how we can do this from the automobile companies that will be testifying here today because we're not going to let go of this. I think that's the message that we can send to the automobile companies. We're not going to let go on this because of the carbon dioxide emissions that we've got to control.

People can say it is a small contributor. That's right. The trouble is that everything we look at is a small contributor.

So, Mr. Chairman, I commend you for these hearings. No one will say you haven't been aggressive. Thank you.

Senator BAUCUS. Thank you, Senator.

Senator Lieberman.

**OPENING STATEMENT OF HON. JOSEPH I. LIEBERMAN, U.S.
SENATOR FROM THE STATE OF CONNECTICUT**

Senator LIEBERMAN. Thank you, Mr. Chairman. I join the ranking minority member in saluting your aggressiveness, as well, and thank you for it.

Mr. Chairman, I have a full statement which I'd ask be included in the record. I'll just say a few words briefly.

Obviously, this is a critical day in these extensive hearings because smog is so important and so harmful a factor in public health and public enjoyment of the environment, and all of the studies we see show repeatedly that the automobile is the number one cause of urban smog. So this seems a particularly appropriate metaphor at this point to say this is, in fact, where the rubber meets the road, and we've got to do something about it.

I must say I've looked over the testimony of the automobile industry, and I'm disappointed by it in the sense that it could have been delivered in 1970 in the earlier phases of consideration of clean air legislation. In fact, in some sense it was delivered in 1970. If I can quote from what the auto manufacturers told Congress in that year,

It presently appears that it will simply not be possible for vehicle manufacturers to achieve the control levels specified in the bill with any fossil fuel burning engine. In view of this, manufacturers unable to meet the control levels specified in the bill would be forced to shut down.

That's a quote from 1970.

Well, we know happily that history has shown that the control levels were met, the industry did not shut down, it is flourishing. That's why, when I read the same contentions in the testimony, that the standards in the bill cannot be met and that there is no promising breakthrough technology on the horizon—and I quote in those last words—I'm not only skeptical, but let me put it this way: I have more confidence in the industry. And I know that it is ex-

actly what our constituents are demanding that we ask of the automobile industry and of ourselves.

With that note, I look forward to the testimony this morning.

Thank you, Mr. Chairman.

[Senator Lieberman's prepared statement follows:]

OPENING STATEMENT OF HON. JOSEPH I. LIEBERMAN, U.S. SENATOR FROM THE STATE OF CONNECTICUT

Thank you for holding these hearings Mr. Chairman on what, in my view, is the most critical aspect of this legislation: control of the automobile.

Unfortunately, the emissions from cars remain, by far the single biggest source of urban smog. The recent Office of Technology Assessment report shows that, even after application of all known controls to all sources, cars and trucks will still be the largest contributors to smog. We are becoming a nation smothered in cars; the number of cars and the number of miles which cars travel are expected to increase by 40 to 60 percent in the next year.

These facts make clear that we must continue to ask more of the automobile industry, despite their efforts of the past years. We must insure that the cleanest car possible is on the road today and in the years ahead.

I am particularly disappointed by my review of the testimony of the automakers. The testimony we will hear today could have been from the 1970 testimony of those same companies. In 1970, representatives of the auto manufacturers told Congress and I quote, "It presently appears that it will simply not be possible for vehicle manufacturers to achieve the control levels specified in the bill with any fossil fuel-burning engine. . . . In view of this, manufacturers unable to meet the control levels specified in the bill would be forced to shut down."

Today, the automanufacturers contend that the standards in the bill cannot be met and there is no "promising breakthrough technology on the horizon."

The Congress acted in 1970 and the automakers responded.

Today, we in Congress are in an even better position to evaluate the automakers' arguments. Those who actually manufacture the engine emission controls do not agree with the dire predictions of the automakers. They believe the standards in the Senate's bill are not beyond technological reach and require optimization and refinement of technology.

My review of the data indicates that this analysis even understates the automakers' ability to meet the standard. General Motors' own data, for example, proves to us that car makers have been doing an excellent job at lowering emissions on a continual basis.

The testimony today will also address the Committee's attempts to introduce some modest approaches to transportation controls.

The combination of increased numbers of vehicles and vehicle miles traveled and the even greater concentration of our population in urban areas translates into growing gridlock. Even a modest improvement in transportation control measures could have dramatic effects, because more than 80 percent of Americans commute to work in automobiles. In the United States, we could save 33 million gallons of gasoline each day and significantly reduce air pollution if the average commuter passenger load were increased by one person.

Our legislation does not require any particular transportation control measure. Rather, it requires areas which fail to meet their planning goals to consider a wide range of options. In some cases, none of these options may be appropriate. The decisions on control strategies remain with the state and local areas.

I look forward to the testimony today.

Senator BAUCUS. Thank you, Senator.

Our first witness this morning is the Honorable Carl Levin from the State of Michigan.

Senator, we're happy to have you here.

STATEMENT OF HON. CARL LEVIN, U.S. SENATOR FROM THE STATE OF MICHIGAN

Senator LEVIN. Mr. Chairman, Senator Chafee, and Senator Lieberman, thank you for the opportunity to testify this morning.

I want to focus just on one aspect of this issue and highlight some of the differences in the two bills as relates to that issue. I think it reflects the differences in the bills on a number of issues, but I'm using this as my illustration.

I'm going to focus on the hydrocarbon emissions issue. And, again, I have difficulties with a number of the other parts of the bill, S. 1630, but this will illustrate the problem.

In the Administration bill, with the steps that they propose to reduce ozone pollution, which is the main constituent of smog, we will require emissions reductions from cars that the Environmental Protection Agency has estimated will reduce ozone from 34 to 37 percent. That's the so-called Administration bill. In S. 1630, the reduction would be from 36 to 39 percent—2 percent more.

So you've got an Administration bill reducing ozone 34 to 37, and then you've got S. 1630, which reduces it from 36 to 39. That is a very small incremental difference—2 percent difference.

The question is: why not do it? Why not go for the 36 instead of the 34? The answer is that the 34 percent will cost you \$1 billion a year, and the 36 percent will cost you \$7.5 billion a year. Now, those are EPA estimates. That is in an exhibit which is attached to my testimony, Exhibit A. You can see those figures entitled, "The Waxman program, \$7.5 billion"—because that's the way they described it—"and the President's program, costing \$1 billion." That's Exhibit A.

The question we face as the Congress is whether or not, for that very small incremental increase from 34 percent to 37 percent, we're willing to send a bill to the American people of 600 percent more. Instead of sending the \$1 billion bill, do we want to send a \$7.5 billion bill for that incremental increase? I would urge you that it makes no economic sense to do so.

Now, the key differences between the Administration bill and S. 1630 are the increase in the useful life requirement in current law for 5 years or 50,000 miles to 10 years and 100,000 miles; and the further reduction in emissions standards to 0.125 from the 0.25, which is in the Administration bill.

Let me just outline the difference on that chart which is in front of you—and you have a copy of that chart right directly in front of you.

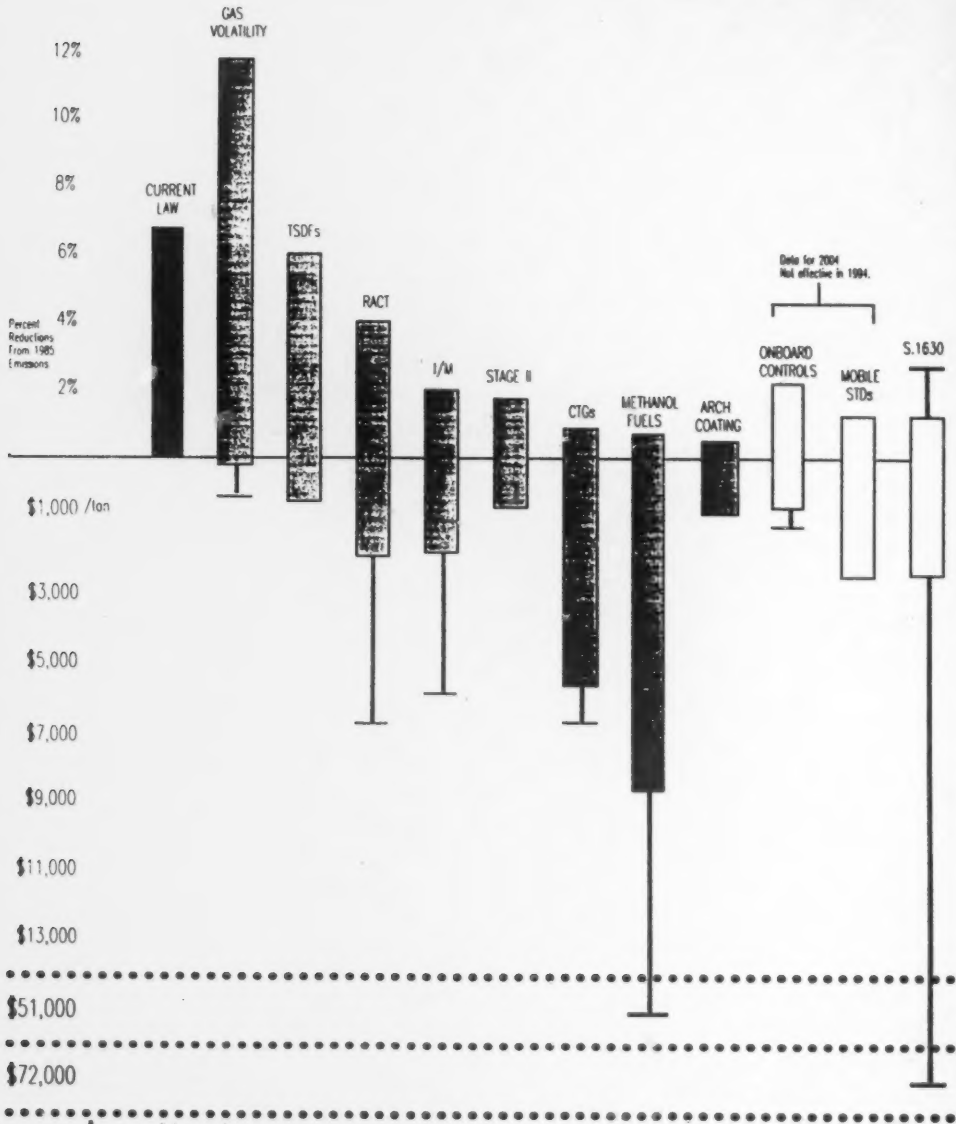
What we've shown on this chart above the line are the increases in reductions for various approaches. We show the increase that you're going to get in current law, for instance; in the reductions of ozone. You can see that that's that black bar, the last one on the left. You get a big increase at no cost whatsoever.

Your gas volatility reductions will give you a huge increase—12 percent reduction at very, very little cost. And the cost is below the line in tonnage.

And if you focus on the third line and the fourth line, you'll see, again, above the line is what we get in reductions; below the line is what we pay for it in terms of tonnage.

You get major benefits from the reductions in gas volatility. You get very, very small benefits from the changes in auto emissions.

VOC Emissions Reductions in 1994 compared to 1985 Emissions and Associated Cost-Effectiveness, by Control Method



└ = possible maximum

NOTE: cost-effectiveness given in terms of cost per ton of VOC emissions reduced.

SOURCE: based on data from OIA ("Catching Our Breath," July 1989) and from EPA.

Senator LEVIN. I have worked with the OTA to develop this chart. We have combined two charts that existed from the book which they have produced. As I said, the portions of the bars above the solid horizontal line indicate the amount of reduction of hydrocarbon or volatile organic compounds—VOCs—which the OTA believes can be obtained from the various categories. And below the bar we get the estimate of the cost.

On gasoline volatility, as I have mentioned, you get a predicted reduction of 12 percent, for a cost somewhere between \$120 a ton and \$760 a ton.

The three bars on the extreme right of the chart were left unshaded by the OTA and by us because those emission reductions will not be effective in 1994, but will be effective in 2004. As I said, when you look at the current law bar, we can see that with no changes in tailpipe standards or any other mobile source changes you get better than a 6 percent reduction in emissions at no additional cost because this is just fleet turnover.

But what I really would like the committee to focus on briefly is the mobile standards bar and the S. 1630 bar at the right of the chart. You'll notice that the S. 1630 bar also has a line extending from the top of the bar. That line represents the possible emissions reductions that could result from S. 1630, assuming those reductions were achievable. In other words, this information in these bars is based on the OTA report.

Now, according to this report, if you have a standard of 0.25 grams for hydrocarbons for five years or 50,000 miles of controlled test driving, you get a reduction of hydrocarbons in nonattainment cities of 140,000 tons per year. Going from 0.41 to 0.25 in both bills gets you 140,000 tons per year. If you mandate that the 0.25 grams be met in use, which the Administration bill would do, you get a reduction of 210,000 tons per year.

If you take the next two steps, which S. 1630 does, and require that the 0.25, the lower standard, be met in use for ten years or 100,000 miles, then you get a reduction of 250,000 tons. And if you cut the 0.25 to 0.125, as the chairman's bill does, you go to a reduction of 300,000 tons.

This is the bottom line. It is based mainly on OTA information, plus other information that I have been able to locate. If you go from the Administration bill to S. 1630, you get a reduction of 90,000 tons per year. The difference between the 210,000 ton reduction in the Administration bill and the 300,000 ton reduction in S. 1630—90,000 tons. Put it in perspective.

The OTA forecasts that mobile source emissions in nonattainment cities in the year 2004, with no changes in current law, will be four million tons annually. That's the tonnage you're going to get. That's four million tons annually in the year 2004.

The Administration bill cuts tailpipe emissions 210,000 tons per year off that four million ton figure. S. 1630 knocks 300,000 tons per year off the four million tons. The incremental gain from this particular standard in S. 1630 over the Administration bill is 90,000 tons out of four million, or about 2 percent, at a phenomenal cost. Now, we attempt to show that on the final bar on the right.

The last two bars on this chart represent the difference between the Administration's standards and S. 1630. The second bar from

the right is the Administration bill. It shows you the cost and it shows you the benefit. The bar on the far right is S. 1630, with the line going up vertically from the top of that bar showing you the extra benefit. The line going down from that bar shows you the extra cost.

Mr. Chairman, the testimony goes into some detail as to the cost per ton, which amounts to \$72,000 per ton for that 90,000 tons.

Now, there may be people who differ with these figures. We'd be happy to have the OTA testify on this. But these are the best figures that we are able to achieve. But, regardless of where your figures may end up, I believe you're going to find that there is going to be something like that right-hand bar if you go with S. 1630 on tailpipe emissions on VOC, and something like the second bar from the right if you go with the Administration bar. And I believe that a rational economic analysis of the difference will tell you that going from 210,000 tons to 300,000 tons out of a four million ton problem is not worth the difference between \$1 billion a year and \$7.5 billion a year in cost, which is what the EPA estimates the cost of achieving that extra 90,000 tons is.

Mr. Chairman, as you pointed out, the industry has gone from 8.8 grams down to where we are now, which is 0.41, since 1970. You can go further. The Administration bill does go further. How much further will depend on how much you want to spend for each incremental gain.

I would suggest that in order to achieve clean air, which is the common goal of all of us, that there are far better ways of spending that \$6 billion a year, or whatever you decide that cost is. That's the EPA estimate. That's in Exhibit A attached to my statement. You may reach a different conclusion as to what that additional 2 percent will cost you. But the best figure we have is the EPA figure of \$6.5 billion extra above the \$1 billion to get you that 2 percent incremental gain.

We thank you, Mr. Chairman and other members of the committee, for giving me this opportunity. I know my full statement will be made part of the record, and we appreciate that.

Senator BAUCUS. Thank you, Senator, very much for your contribution.

I'm just curious what your reaction is to the basic point of view that some people have, that back in 1970, when the auto industry was crying wolf and said it couldn't be done, technology isn't there—essentially just all these horror stories on how excessively, extremely, overly-expensive all of this was, and yet, within 11 months after the passage of the bill we did develop catalytic converters and, in fact, increased the productivity of the industry. I'm just curious what your reaction is to that basic charge when today the industry is making the same points.

Senator LEVIN. I have two thoughts. Number one, I'd have to go back and see their testimony in context as to whether or not they said that certain standards were unachievable. Maybe those were not the standards that were put in the final law. I don't know whether or not those quotes relate to the standards that were put in the law or the standards which had been proposed and then were compromised. But I don't want to go back and judge them.

The other possibility is they were wrong in 1970.

Senator BAUCUS. Could they be wrong today?

Senator LEVIN. Sure. We all could be wrong today. We have to make the best rational judgment we can. But when you get that incremental gain, unless you can get some objective source to tell you that you're going to be able to gain something valuable for the money you're investing, I would suggest we invest that money in some other way to reduce the clean air problem.

By the way, there is an air problem, and we ought to invest money to clean it up. I'm just telling you that's not worth it. Your tailpipe gain in your bill does not benefit clean air enough to justify going from \$1 billion to \$7.5 billion. And that is my point, and I think my point is correct and accurate.

Again, it is difficult for me to go back and assess whether the testimony in 1970 was accurate without seeing all the testimony and judging it.

Senator BAUCUS. Well, frankly, the problem is this, Senator: we have achieved significant reductions in hydrocarbons and nitrogen oxides over the years—particularly hydrocarbons. There have been very significant reductions.

We're down to the point now in our country where everyone in America now has to help contribute at an incremental level. Everybody is going to have to go a little bit further, but everybody is going to have to do it. And it is true that the automotive industry has made significant reductions in tailpipe emissions.

It is true, based upon the provisions that this Congress enacted and the President signed years ago. I doubt, frankly, that those emissions would have been achieved if Congress did not pass that legislation. Nevertheless, the legislation was passed, the industry has gone to significant strides to very significantly reduce tailpipe emissions. It is true.

Now we are down to the incremental additional efforts that everyone must take. If you look at large stationary sources, the provisions in the bills before us require large stationary sources to also reduce air emissions, but again only about 2 percent—the same amount that you refer to in round two. It is a very small amount. It is not much at all. But everybody is going to have to contribute.

If we let one person off the hook, one group off the hook in providing for an incremental reduction in air emissions, then logically we have to let all the other incremental efforts off the hook. So, number one, everybody is going to have to contribute a little bit. That's point number one. Point number two is: it is not going to be nearly as costly as these dire predictions of the auto industry. There are others that have exactly contrary views as to the cost, other than the auto industry. One, frankly, is the State of California.

Let me just read a paragraph from testimony that we're going to hear later today. This is testimony from Tom Cackette, Deputy Executive Director of the California Air Resources Board. He says, in part,

We have assessed in detail the cost of meeting the 1993 standards set forth in S. 1630. We estimate the cost of compliance to be under \$100 per vehicle. Although we are not able to precisely estimate the cost of second stage standards, we offer a rough estimate of another \$100 per car. When comparing these costs to the lower emissions achieved, we conclude that both sets of standards are cost effective, espe-

cially when compared to the cost of applying the second or third wave emission controls to industrial sources of pollution.

Now, the State of California has been aggressive in trying to meet air pollution and urban smog. They are positive. They try to find results. And they believe—they have a lot of experience in this area—they believe, with the experience that they have under their belt from working on solving the problem, this \$200 or less total round two plus total round one.

So I would say to you, again, point number two, that there are others who have a lot of experience in this area who do say it is cost effective. And point number one, again, is that everybody is going to have to add a little bit.

Senator LEVIN. Could I comment on that?

Senator BAUCUS. Absolutely.

Senator LEVIN. I couldn't agree with you more that everybody is going to have to add a little bit. That's in the Administration bill. You have to figure out what the cost of that is compared to what the cost is in your bill for what you add. It really comes down to that.

Are you, in your bill, picking up enough additional gain in reductions to justify going from \$1 billion to \$6.5 billion a year? That's what the EPA figures are. That's not the auto industry's figures. There is a suggestion in your comment that those figures came from the auto industry. They didn't. My figures come from EPA and OTA, not from the auto industry or from California or from somebody that presumably has an interest, but from EPA and OTA. That's point number one.

Mr. Chairman, you say nobody can get off the hook. I agree with you on that. Nobody is off the hook in the Administration bill. Everybody does something in the Administration bill and in your bill. So I don't think, frankly, that kind of a judgment or that kind of rhetoric that nobody can get off the hook is accurate, since the Administration bill, according to OTA, contains a major challenge to the auto industry to achieve the 0.25 in use at 50,000 miles.

Third, I would urge you to ask the OTA for their estimate on cost. I don't think they can even give you one for second phase. But I would urge you to ask them and get as much information as you can from OTA. I think it would be very valuable to the deliberations of the Congress.

Senator BAUCUS. Absolutely. We want the estimates of everybody who is credible in this area. EPA certainly is important. OTA is important. We also think that the California Resources Board is also important.

Senator LEVIN. Yes.

Senator BAUCUS. They have direct experience. So this committee can only get the information that it can from various different, objective sources—

Senator LEVIN. Of course.

Senator BAUCUS [continuing]. And then make a judgment.

Senator LEVIN. But we do, again, have EPA and OTA in my testimony, and the per tonnage cost of each of these approaches is based on their material plus other—in one case, as I indicated, material that I have had to go out and seek myself because we couldn't get it anywhere else.

But look at the per tonnage cost. That's all I would ask you to do.

Senator BAUCUS. I ask you to look at the per car cost. If the per car cost is, in fact, less than \$200 by today's estimates—and don't forget the provisions of this bill round two do not go into effect for another 13 years, and I'd bet you dollars to donuts that that cost is going to be lower by the time we get down to—

Senator LEVIN. My answer to that would be—

Senator BAUCUS. And another point here, too, is that these pollution control technologies are also productivity increase forcing technologies; that is, industry will be able to re-tool, tighter tolerances will come into place, and I guarantee you that those companies will be more productive. Their productivity will commensurately increase, as well. That happened. That is a strong correlation.

Senator LEVIN. On your \$200 cost per car figure, I'll let the industry or others try to break down the figures per car.

My answer to your point, though, is: what do you gain?

Senator BAUCUS. Two percent reduction.

Senator LEVIN. What do you gain? You have to decide whether or not that gain—you can put it in a per car figure which sounds low, but if you want to compare apples and apples, you've got to look at how much reduction in overall ozone you get from each investment of this society's dollars. If you put \$1 billion here and get 2 percent, you want to put \$7 billion for the next 2 percent, \$70 billion for the next 2 percent, \$700 billion for the next 2 percent.

But when you divide it per car it comes out pretty low. But when you look at the cost per ton of what you're getting, compared to other alternatives, it is extremely high. So I would urge you to compare apples and apples. Look at the tonnage reduction for each of the various proposals that are in front of you.

Senator BAUCUS. I hear you, this could go on forever. I think most individual Americans, frankly, are less concerned about per ton costs. I think most Americans are far more concerned about the per car cost.

Senator LEVIN. I agree. But they also want to know what they're getting for the per car increase.

Senator BAUCUS. They're going to get cleaner air. I think most Americans will pay \$200—and we're talking about the year 2003—\$200 more per car to get cleaner air.

Senator LEVIN. The way you phrase it, Mr. Chairman, "Most Americans will pay more to get cleaner air," but when you put the cost of what they're paying more and tell them the incremental increase that they're getting in cleaner air, you may get a very different answer.

Senator BAUCUS. That \$200 per car in the year 2003 is going to be a very infinitesimal part of the cost of a car in the year 2003.

Senator Chafee.

Senator CHAFEE. Thank you, Mr. Chairman. I'll make this brief, because we've got some other witnesses coming along that we certainly want to hear from.

First, I think your charts are excellent. I think the gas volatility point you make is a very good one. We've had witnesses here on that. As you know, in the Northeast they are now mandating that

the gasoline have that reduction in volatility, and that will be nationwide.

The problem, Senator, with your presentation is that if you look at your last bar under S. 1630, and I know you've got a variable in there that goes way, way down to \$72,000, but if you cut it off where your bottom currently is—that is, at about \$3,000—the trouble is that in all the alternatives it costs that, likewise, to get your percentage reductions. And so we've got a choice. Should we have it at this cost X—let's say at \$3,000 per ton—or \$5,000 per ton in some other area? Now, there's the quandary we're confronted with in this committee.

Senator LEVIN. Senator, you—

Senator CHAFEE. Maybe it is not worthwhile. You say forget it, we've done all we can, and that's that. But any other alley we go up is as expensive or more expensive per ton.

Senator LEVIN. Senator Chafee, you say if you cut the bar off where?

Senator CHAFEE. Well, you've got, on your last bar there, a bottom to it with a possible—I assume that your straight line going down is a possibility, isn't it?

Senator LEVIN. No. That's not a possibility. That's what S. 1630 costs. That's what the 90,000 ton add on gets you for \$6.5 billion. Your point I happen to agree with, because the bar right next to it, where it is cut off, is the Administration's bill. That second bar from the right, just exactly the way you described it, with the line drawn in, is the Administration. It is the right-hand bar which is S. 1630 with that huge additional cost going down to \$72,000 a ton to pick up those 90,000 additional tons.

Senator CHAFEE. Yes, but in your own description you say "possible maximum." You describe it there.

Senator LEVIN. That's the best estimate we can give you. And, by the way, this is based on EPA figures. EPA says that you go to a 300,000 ton reduction from a 210,000 ton reduction.

Senator CHAFEE. Why, Senator, do you have a bottom to your chart there? Why is the line there at \$3,000?

Senator LEVIN. At what?

Senator CHAFEE. Why do you have a line at \$3,000? Why don't you extend your bar all the way down?

Senator LEVIN. As we say in our testimony, we're trying to compare two bills. Those two bars are two bills. The right-hand bar is S. 1630. You can see the title on it. And we tried to show the comparison between that and the Administration bill, which is next to it.

Senator CHAFEE. Which is the mobile standards.

Senator LEVIN. In the Administration bill. And that's the extra cost—that line going directly down. That vertical line is the extra cost. It is our estimate, based on EPA numbers.

Senator CHAFEE. I'm not sure I concur with that conclusion. But, in any event, your chart is useful. I think we'll consider your point. I just do want to point out that we hear from the automobile people, we hear from the gasoline people, we got testimony yesterday morning about the horrible things that are happening on the outer continental shelf. And then in comes somebody saying there

is no proof that the drawing on the continental shelf really affects the air standards in Southern California.

So you have sat through a zillion hours of testimony, as I know, in your own committees, and you just try and balance it all.

Senator LIEBERMAN.

Senator LIEBERMAN. Thank you, Senator Chafee.

Just to my colleague and dear friend from Michigan, I appreciate your arguments and will go over your graphs. So much of this is comparison of data, because it is a technical area and we're trying to make an important judgment. I think all of us agree that the public really does want cleaner air and is willing to pay more for it. All the polls say that, and just in personal experience from all my constituency in this area. I appreciate what you're saying in that we ought to ask how much cleaner air we get for how much money we put in.

There are two points I want to make on the numbers, just to re-emphasize the point that the Chairman made, which is that EPA does estimate. There is a critical difference in the estimates here.

EPA estimates \$500 per car for the second stage of standards that we're talking about. And, as the Chairman indicated, California estimates less than \$100. So that's a critical part of the difference in the overall estimate of \$6.5 billion difference. And, as we go on, we'll obviously have to decide which one makes more sense.

Secondly, OTA, in its analysis is in response to the request from Congressman Waxman—so it is considering his bill, but it is substantially similar to S. 1630—does conclude that the committee bill can produce or will produce hydrocarbon emission reductions that are as much as 55 percent greater than the Administration bill will. So there is some difference in projections here of what the clean air payoff will be for the added cost that we put in. I just wanted to say that for the record.

I would love to ask you more questions, but I have a feeling that you and I are going to continue this dialogue, if not here, elsewhere. And I look forward to it respectfully.

Senator LEVIN. So do I. Thank you.

Senator BAUCUS. Thank you, Senator, very much.

Senator LEVIN. Mr. Chairman, let me again thank you and the other members of the committee. You have set out a long list of witnesses. You have been very patient with me, as you always are—we're old friends. We look forward to working with you and the other members of the committee to try to achieve something which is fair and balanced, and we're grateful for the opportunity and, frankly, for the fluidity of the discussion and the debate.

Senator DURENBERGER. Mr. Chairman, before the Senator from Michigan leaves, let me at least make a comment.

I didn't hear all of his presentation. I only heard the latter part, and that's the part where the experts up here are supposed to take apart the Senator from the auto State.

I thought you did a very good job, Carl. In fact, I thought you did an excellent job. I agreed with what I heard by way of response, and I suspect in your initial presentation you did a better job than I did before we put this bill together in trying to explain to its main authors—the Chair of the subcommittee, and so forth—a couple of points: one, consumers do care. I think when we get down

to putting some dollars against the role that each automobile is going to play in contributing to the overall problem, that we may well hear from people who have to buy those automobiles and operate those automobiles. I don't think at the present time we haven't clearly put a price tag on that choice versus a lot of other choices.

I believe that there are less costly alternatives than that last step that the committee bill takes to achieve the very same end. I think they are complicated, they are difficult, they are a lot of things to do with traffic control and congestion and a lot of other things. It is much easier for the authors of this legislation—I'm one of the co-sponsors, but not the main author—to say let's just ask the automobile industry to pick up that last one percent or one half of one percent, or whatever it is, because that is simpler than asking every city council in this country and every State and everybody else to do something about traffic.

So I hope that during the course of this discussion, whether we get into alternative fuels, traffic control, and a variety of these things, that we can count on you to be here to continue to make sure that we make the comparisons that you tried to make today in terms of which investment is better for us to make. My tendency is to believe—they don't make any cars in my State. One company makes a bunch of little trucks, and that's about it. So I'm not carrying any weight for anybody in the industry, such as you have to. But I hope to carry some weight for the people of this country who have to pay the price tag for this cleaner air.

Senator LEVIN. I thank you, Senator Durenberger. And thank you for your comments. I think the point is a good one and it is, in a sense, Senator Lieberman's point, as well, and others, which is: the public is willing to pay more for cleaner air. I agree with the Chairman. I think the obligation on us, though, as legislators, is to say how much cleaner for how much more.

The public is willing to pay quite a bit more for a lot cleaner air. But are they willing to pay a lot more than that for very minor increase in cleaner air? So those are the questions that we will all be struggling with.

Again, I'm grateful for this opportunity and for your understanding.

Senator BAUCUS. Thank you, Senator. You are a very, very effective advocate, I must tell you. You did a great job. I review your statement, frankly, and also ask you, if you could, to provide for us some of the assumptions for the basis for some of the statements you're making so that we can have a better bill, frankly. We need some additional input.

Senator LEVIN. I would be happy to do all of that. I hope it is all in the prepared testimony, but I will go over it again with your staff, and where it is not there we will add it.

Senator BAUCUS. I would appreciate that. You did an excellent job. Thank you.

Now we have a panel, including: Mr. Samuel Leonard, Director of Automotive Emission Control for General Motors Corporation; Mr. Donald Buist, Director of Automotive Emission for Emissions & Fuel Economy Office, Ford Motor Company; Mr. Ronald Boltz, Vice President, Advance Product and Operations Planning for Chrysler Corporation; Mr. Michael Walsh, who is a technical con-

sultant; and Mr. Thomas Cackette, Deputy Executive Director of the California Air Resources Board.

We'll start off with Mr. Leonard.

I want to tell all of the witnesses that your full statements will be included in the record. I'd ask you to summarize to five minutes each. When the amber light goes on, that means that you have one minute remaining. Thank you.

STATEMENT OF SAMUEL A. LEONARD, DIRECTOR, AUTOMOTIVE EMISSION CONTROL, GENERAL MOTORS CORP.

Mr. LEONARD. Thank you, Mr. Chairman. Good morning.

My name is Samuel Leonard. I am Director of Automotive Emission Control for General Motors Corporation.

GM is prepared to commit substantial additional engineering and capital resources and to take some enormous business risks to reduce the incidents of nonattainment that are driving this legislation.

After the summer of 1988, we heard assertions that the pollution was getting worse and that a public health crisis was upon us. Today, we hear very little about the summer of 1989, although for most areas it shows the most dramatic year-to-year improvement for ozone in history. One thing is clear from this dramatic and weather-related swing: we need a new method of measuring attainment of the ozone standard. We need one which will truly tell us how much progress is being made.

Another thing that is clear is that we are continuing to make steady progress in improving air quality. Indeed, except for Los Angeles, every area of the country is in compliance over 99 percent of the time.

General Motors endorses S. 1490 as the base upon which to build the country's clean air program in the future. S. 1490 presents a serious challenge to the vehicle manufacturer; however, it incorporates several key elements that make this challenge practicable. First, it establishes standards that are at least arguably technologically feasible. Second, it provides, if passed this year, adequate lead time. Third, it provides phase-in of the new standards over a three-year period. Fourth, it provides at least an interim separation of certification and in-use standards. And, finally, it would allow averaging.

That is not to say we don't have concerns about S. 1490. We hope these concerns, which are delineated in our record statement, will be addressed and eliminated in mark-up. Taken together, EPA estimates that the mobile source provisions of S. 1490 will reduce ambient hydrocarbon levels by 34 to 37 percent at an annual cost of \$1 billion.

For the tailpipe requirements of S. 1490, alone, GM estimates capital costs of approximately half a billion dollars. The total capital costs and other costs will be even higher after taking into account other car and truck requirements related to the evaporative emissions, the sophisticated on-board diagnostics, and even, on the stationary source side, the new source permitting requirements—which, by the way, will burden the U.S. manufacturers, but not our competitors abroad. Our foreign competitors will also not see the

electrical rate increases that the new Clean Air Act will require, nor will they be burdened by the complex and burdensome compliance requirements under title I of the act.

Unlike S. 1490, S. 1630 goes beyond the limits of technological feasibility. It fails to provide adequate lead time or the other essential elements included in S. 1490. It imposes an oxides of nitrogen standard that may increase ozone levels in many areas in the country. It forces the incorporation of an on-board control system, the safety of which has been questioned not only by the vehicle manufacturers, but also by the National Highway Traffic Safety Administration and public interest groups.

S. 1630 also imposes a second tier of standards which even the proponents agree are not technologically feasible.

EPA has estimated that the title II provisions of H.R. 2323, which is similar to S. 1630, would reduce ambient hydrocarbons by 36 to 39 percent, but at cost in excess of \$7.6 billion per year.

In a comparison of S. 1490 and H.R. 2323, EPA noted that S. 1490 would provide 95 percent of the VOC emission reduction, but would save \$6.6 billion annually.

Without doubt, however, the most controversial provision of S. 1630 is the attempt to incorporate carbon dioxide standards into the Clean Air Act. This provision would introduce an entirely new control program with effects that cannot be foreseen.

As presently constituted, it would threaten serious disruption of the U.S. auto industry. There is no reason to believe today that by 1995 or even by 2003 that technology will allow compact, mid-sized, large cars and station wagons to meet, let alone maintain for its life, the proposed level of carbon dioxide control.

As General Motors has testified before a subcommittee of the Commerce Committee, if national interests dictate government intervention to deal with carbon dioxide, then we believe the most effective and efficient government programs to do so work through, not against, market forces and include consumer incentives for compliance.

We also think that fair public policy should not force a single sector or industry to bear a disproportionate share of the cost. For this reason, in considering responses to global warming concerns, we have suggested that a comprehensive fee approach be considered. Such a greenhouse or carbon fee merits national discussion.

That is my statement. Thank you, Mr. Chairman.

Senator BAUCUS. Thank you very much, Mr. Leonard. We appreciate that.

Senator BAUCUS. Next we will hear from Mr. Buist. How do you pronounce your name?

Mr. BUIST. Buist.

Senator BAUCUS. Buist. Thank you.

STATEMENT OF DONALD R. BUIST, DIRECTOR, AUTOMOTIVE EMISSIONS AND FUEL ECONOMY OFFICE, FORD MOTOR CO.

Mr. BUIST. Thank you.

Ford supports measures that will have a positive effect on the environment. We recognize that we're part of the problem and, therefore, we want to be part of the solution.

Clean air is an objective that everyone shares. The greatest contribution to lowering vehicle emissions we feel will result when new vehicles with state-of-the-art emissions control systems replace older cars and trucks now in service.

Even taking into account increases in the number of miles Americans will drive, we expect average hydrocarbon emissions to decrease by about 38 percent in urban areas by the year 2000.

Nevertheless, we recognize that smog continues to be a major problem in some areas of the country, and are willing to do more to further reduce vehicle emissions. We believe that the President's proposal, S. 1490, focuses on implementing the strategies that have the most potential for public value, and for that reason we support its major objectives.

We support further reductions in automotive exhaust emissions standards. The standards in the President's proposal will require the elimination of more than 97 percent of the hydrocarbons once emitted by passenger cars. Further tailpipe controls, even if technically achievable, would result in very small incremental air quality benefits.

To achieve further reductions in overall motor vehicles emissions, the President has proposed the use of alternative fuels, and Ford strongly supports that proposal. For many years, Ford has been a leader in the development of vehicles that run on alternative fuels.

The most promising technology today is our flexible fuel vehicle, which can operate on ethanol, methanol, gasoline, or any combination of these fuels. We believe that this vehicle is the perfect fit for the President's program.

Even though there are still open issues regarding alternative fuels, the progress we have made gives us confidence that these can be resolved in time to meet the program's proposed schedule. If such a program is implemented, the first step is for State and Federal governments and the oil and auto industry to work together to resolve implementation issues, thus ensuring a worthwhile and successful air quality improvement program.

Meeting the requirements of the President's bill will put a severe strain on our human and technological resources, and certain of its provisions still cause us concern. Nevertheless, we intend to do everything we can to be supportive of these initiatives.

The remainder of my comments will focus on the automotive requirements in S. 1630.

With respect to the proposed 1993 passenger car requirements, we support the 0.25 non-methane hydrocarbon standard, which appropriately applies to non-methane hydrocarbons and is the same as proposed by the President. This level represents the maximum feasible reduction, while still providing consumers with an acceptable level of function and performance. The proposed 0.4 NO_x standard, while appropriate for California, is not a good air quality strategy for the nation, as a whole.

The Office of Technology Assessment found that NO_x reduction can actually be counterproductive in combatting ozone formation when the atmosphere contains a comparatively low ratio of hydrocarbon to NO_x gases.

In addition, the proposed 1993 standards include no phase in. A phase in is necessary for a manufacturer—especially a full-line manufacturer like Ford—to refine its designs and processes before incorporating them into full-scale production and to field test and factor consumer reaction into the development process.

Moreover, S. 1630 would require manufacturers to meet the same standards for both certification and in-use for 10 years or 100,000 miles. This requirement fails to take into account any factors over which we have no control, but that affect compliance in use. These include vehicles maintenance, operating conditions, and fuel and oil quality.

These standards are even more stringent than those adopted by California, which is dealing with the Nation's worst air quality problem. In recognition of the difficulty of meeting its new standards, California set a three-year phase in schedule, adopted less stringent emission standards for determining in-use compliance, and limited the responsibility for in-use compliance to 75,000 miles for hydrocarbon and CO and 50,000 miles for NO_x.

With regard to the truck requirements in S. 1630, the proposed standards would require more than a 60 percent reduction in hydrocarbon emissions for trucks under 3,750 pounds, and more than a 50 percent reduction for other light trucks. Similar percentage reductions are required for CO and NO_x. The light truck standards are more difficult to meet than the proposed car standards because trucks must be designed to meet unique functional requirements and must meet more stringent useful life requirements.

Regarding the proposed 2003 passenger car requirements, the second tier emissions standards in S. 1630 are technically infeasible and, even if they could be met, would have little affect on improving the Nation's air quality. In combination with the proposed 100,000 mile useful life requirement, these standards represent about an 80 percent increase in stringency versus today's standards. Even though 2003 seems far in the future, there is no promising breakthrough technology on the horizon.

Given the progress already made in reducing vehicles emissions, a well-reasoned alternative fuels program is likely to yield far greater air quality benefits than the second tier of standards in S. 1630.

Finally, I'd like to comment on the proposed passenger car carbon dioxide standard. This all new requirement would, in effect, require manufacturers to increase the fuel economy of their passenger car fleets by more than 25 percent by 1995, and by more than 80 percent by 2002. At recent Senate Commerce Committee hearings, Ford testified that fuel economy standards of these levels are far beyond what can reasonably be projected for full-line manufacturers. If adopted, they would result in a significant reduction in average vehicle size and utility, which we believe is contrary to the needs and wants of the American consumer.

At the same time, higher fuel economy standards can contribute only modestly to reducing global warming, because CO₂ emissions from U.S. vehicles account for only about 2.5 percent of the global warming gases. Even doubling the fuel economy standards of all cars on the road would only reduce the global warming gases by about a half of a percent.

In summary, Ford wants to be part of the process that will improve the nation's air quality. We support the President's proposal as a constructive approach, even though its requirements are very tough and will stretch our resources to the limit.

S. 1630 goes beyond what is feasible in the auto sector, yet would yield very marginal incremental air quality benefits over the President's proposal.

We believe a sound alternative fuel program has the potential for substantially greater air quality benefits than the second tier of standards in S. 1630.

Thank you.

Senator BAUCUS. Thank you very much, Mr. Buist.

Next we will hear from Mr. Ronald Boltz.

**STATEMENT OF RONALD BOLTZ, VICE PRESIDENT, ADVANCE
PRODUCT AND OPERATIONS PLANNING, CHRYSLER CORP.**

Mr. BOLTZ. Thank you, Mr. Chairman, for the opportunity to express Chrysler's views concerning proposed revisions to the Clean Air Act of 1970 and related amendments.

Chrysler strongly supports the goals of the Clean Air Act and is proud of its accomplishments in emissions control technology. As you know, exhaust emission standards presently in effect reduce hydrocarbon and carbon monoxide emissions by 96 percent, compared to pre-control cars of the 1960s. Nonetheless, air quality goals have not been met in many regions of the United States, and there is a justifiable concern that unless the Clean Air amendments are modified, these goals will not be attained in the future. We agree that further efforts are required, and are ready and willing to shoulder our fair share.

In Chrysler's view, the key issue confronting Congress is finding the most cost effective way to achieve air quality goals. Indeed, the clean air goals must be achieved, but in a manner that results in the least cost to the American public.

The merits of various approaches are being debated in Congress presently. I would like to highlight the cost effectiveness of two proposals being considered by this subcommittee—S. 1490, introduced by Senator Chafee; and S. 1630, introduced by Senator Baucus.

The chart before you—which is also included as attachment one in our testimony—compares the relative difficulty of meeting the requirements of S. 1490 and S. 1630 to current standards for hydrocarbon emissions, projects the benefits to be gained, and the cost to the American public of achieving these benefits.

As indicated, the current standard achieves a 96 percent reduction in hydrocarbon emissions, a key ingredient in ozone formation. S. 1490 is projected by EPA to result in a hydrocarbon reduction of 93 percent, an incremental improvement of 2 percentage points, at a cost to the American public of approximately \$1 billion annually.

S. 1630 is projected to provide a hydrocarbon reduction of 99 percent, an incremental improvement of 3 percentage points, at a cost to the American public of approximately \$7.5 billion annually. In essence, gentlemen, the last one percent of hydrocarbon control

provided by S. 1630 costs the American public \$6.5 billion annually—nearly seven times the total cost of S. 1490.

The cost effectiveness comparison assumes the provisions of both S. 1490 and S. 1630 are achievable in practice with adequate reliability. In fact, the 0.25 gram per mile hydrocarbon and 50,000 mile useful life requirements for passenger cars included in S. 1490 do stretch the limits of technical feasibility. Adequate assurance of our ability to comply with these requirements in a reliable manner remains to be established; hence, the risk of recall associated with S. 1490 is dramatically higher than current standards, as shown on the chart.

The ultimate requirements of S. 1630—including 0.125 grams per mile hydrocarbons, 0.17 grams CO, and 0.2 grams NO_x at 100,000 miles useful life—cannot be achieved reliably with any technology known to Chrysler at any price. Therefore, our assessment of risk is judged to be extreme.

Senator, as there was considerable discussion following Senator Levin's testimony regarding cost estimates on a per unit basis, I would like to mention that the incremental costs noted in the bars to the right, as you view the chart, of \$6.5 billion are equivalent, by EPA's estimates, to \$500 per unit for that 1 percent reduction.

Senator Baucus, you brought up some testimony that I presume we will hear later this morning suggesting that the incremental cost of the bars to the right of the chart may be about \$100. I would like to mention to you that Chrysler has estimated an intermediate set of standards, the California requirements that will be imposed during 1993 through 1995, that require 0.25 grams per mile hydrocarbon, 3.4 CO, and 0.4 NO_x, far short of the bill you introduced in its ultimate form. We estimated that the cost of meeting that bill would range from \$200 to \$303 per unit. So we do agree with EPA figures of \$500, because those requirements are far more stringent than we would see in California.

The issue is: Will highway vehicles contribute to the solution in the same proportion that they contribute to the problem? Yes, highway vehicles will, in fact, bear more than their fair share under S. 1490. For example, highway vehicles presently contribute 40 percent of total VOC emissions. S. 1490 will reduce this contribution by about 20 percentage points—or about half—and fleet turnover will further reduce vehicle contribution by an additional 10 percentage points, or about another 25 percent. In total, highway vehicle VOCs will be reduced by 75 percent, from 40 percent presently, to 10 percent by the year 2020.

In summary, Chrysler believes that S. 1490 achieves the best balance between the need for further emissions reductions, cost effectiveness, and reliable control technology.

Our detailed comments and a comparison of the two bills, including important lead time, technology forcing, and phase-in considerations, will be summarized in our formal submission, to be forwarded shortly. At this time, however, I would like to highlight one unique element of S. 1630.

Senator BAUCUS. I am going to have to ask you to summarize, in fairness to every other witness.

Mr. BOLTZ. Thank you very much.

We believe, with regard to the CO₂ standard, sir, that the global warming issues require and deserve considerable study before an appropriate and effective policy can be fashioned. Inclusion of these issues with other clean air imperatives will impede actions required to achieve national air quality goals. To permit a timely resolution of Clean Air Act amendments, global warming issues should be addressed separately.

I would also like to add that a more direct and fruitful approach to the global warming problem may very well be to impose a carbon fee on all fuels containing the carbon atom, bringing market forces to bear on all controllable CO₂ sources, not merely the passenger car sector of the economy.

Thank you very much.

Senator BAUCUS. Thank you very much, sir.

Next we will here from Mr. Michael Walsh.

STATEMENT OF MICHAEL WALSH, INDEPENDENT TECHNICAL CONSULTANT

Mr. WALSH. Good morning, Mr. Chairman.

The health and environmental need for more stringent vehicle pollution controls in my judgment can no longer be debated. During 1988, the last year for which we have complete data, over 100 areas of the country exceeded healthy levels for ozone, and 44 for carbon monoxide. Over 130 million Americans live in these unhealthy areas—more than half the country.

Further, these same pollutants which cause local and regional problems contribute significantly to the global concern over climate modification. Background increases of the "bad, low-level ozone" blanket the earth and trap heat, and globally these levels have approximately doubled this century.

Vehicle emissions of hydrocarbons, NO_x, and CO, as well as CO₂ and CFCs, are dominant contributors to the global concern with climate modification. To achieve the healthy air quality objectives necessary to protect public health and the environment will require substantial additional control of emissions.

As the single largest source of nitrogen oxides, hydrocarbon, and carbon monoxide emissions, motor vehicles must be a major focus of additional control. Vehicle travel in the United States is increasing by about 25 billion additional miles per year. This growth, coupled with poor emissions control during the second half of an automobile's life and less stringent control on other mobile sources, is offsetting the overall gains from the automobile standards adopted to date.

Without additional controls on vehicles, their emissions will start to increase again over the next decade. Vehicle miles traveled growth is currently increasing more rapidly than over the past few years, indicating that even greater vehicle control per mile driven will be needed. The head of the Highway Users Federation, for example, recently stated that growth rate in many urban areas is currently about 6 percent a year, and overall mileage could double between now and the year 2000.

Much greater control is, fortunately possible—as the State of California has shown. Tightening of the auto NO_x standard from

the current 1 gram per mile to 0.4, the current California standard, by 1992, and requiring the standard to be met for 100,000 miles starting in the 1995 model year, will reduce emissions from these vehicles by about 35 percent. Enhanced I&M would add another 10 percent reduction, and adoption of the so-called stage II standard, 0.2 grams per mile by the year 2000, would add another 10 percent, thereby increasing the overall reduction to about 55 percent.

Adoption of nine pound reed vapor pressure for fuel would lower hydrocarbon from cars by about 23 percent; on-board refueling by another 10 percent; tightening the exhaust standard from 0.41 to 0.25 and requiring the standard for 100,000 miles, another 10 percent; enhanced I&M would add another 10 percent; and the so-called stage II standard by the year 2000 would increase the reduction by another 5 percent, for a total of about 58 percent.

Adoption of the RVP would also lower CO from cars. And extending the useful life would add an additional 15 percent. Enhanced I&M, an additional 20 percent. So, in the aggregate, substantial control on the order of 58 percent would result from these standards.

I'd like to focus on several aspects of the committee bill, if I could.

First, the carbon dioxide standards. With regard to global warming, it is important to emphasize the dominant role of North America as a potential vehicle market. Forty percent of the 400 million cars in the world are in the North American market. As a result, vehicle characteristics in the United States will have a significant affect on vehicle characteristics all around the world.

A single tank of gasoline consumed by each of these vehicles produces between 300 and 400 pounds of CO₂. The U.S. fleet currently uses over 35 percent of the world's transport energy, and transport consumes almost one third of the total energy consumed in the world.

The fossil fuel CO₂ emissions in the United States from the transport sector, alone, exceed total fossil fuel CO₂ emissions from all sources in all of Latin America or all of Japan, or all sources in all of the Middle East, or all sources in West German, and many, many other countries. If we don't start to address this problem here and provide some leadership in the vehicle area, where can it start? The CO₂ standards in the committee bill are necessary to stabilize U.S. auto fuel consumption and CO₂ emissions.

With regard to the second step of standards, the committee has proposed that they go into effect in the year 2003. These standards are necessary to continue the progress downward beyond the year 2003 in the face of continued vehicle growth. The issue is this: As long as the vehicle population continues to grow, the emissions rate per mile must gradually be reduced or pollution will rise. Without these additional controls, continued growth in vehicles will cause an upturn.

While these requirements are clearly intended to be technology forcing in light of the serious and pervasive air pollution problems described earlier, I must say they are more like technology nudging compared to the push which occurred during the early 1970's. At that time, not one single car was on the road which was equipped with a catalytic converter, much less having achieved the stand-

ards for 50,000 miles. Most cars were not even designed to operate on unleaded fuel, and most gas stations didn't even sell it.

With regard to the electronic control systems, which have become such an integral part of today's systems, they were not even envisioned by the technological forecasters.

Senator BAUCUS. I'm going to have to ask you to summarize, Mr. Walsh.

Mr. WALSH. I will. Thank you, Senator.

In 1988, on the other hand, 15 years before the requirement is imposed, numerous models have already certified to these levels. As fuels continue to improve, electronics evolve, and catalysts and other technology advance, the second step seems quite modest by comparison to the earlier push.

Thank you very much.

Senator BAUCUS. Thank you very much.

Mr. Cackette.

STATEMENT OF THOMAS CACKETTE, DEPUTY EXECUTIVE OFFICER, CALIFORNIA AIR RESOURCES BOARD

Mr. CACKETTE. Mr. Chairman, thank you for inviting me to testify here today. I know you all know how serious the air pollution problem in Los Angeles is. It is also serious in every other city in California. About half of the pollution that causes that air pollution problem comes from vehicles, and to that extent we are not atypical. We are very typical of other—

Senator BAUCUS. Mr. Cackette, I wonder if you could please suspend this. We have to dash over for a vote. We both want to hear your testimony.

Mr. CACKETTE. Okay.

Senator BAUCUS. We will go vote and will come right back. So I will recess now for 10 minutes.

[Recess.]

Senator BAUCUS. The committee will come back to order.

When Senator Chafee and I left for the vote, Mr. Cackette was testifying.

Mr. Cackette, why don't you just begin all over again?

Mr. CACKETTE. Okay.

Thank you, again, for inviting me to testify. You all know that Los Angeles has a serious air pollution problem. We have a similar problem, although not as serious, in every city in California. About half of the problem comes from motor vehicles, and to that extent we are not atypical of the rest of the country.

Reducing emissions in motor vehicles has been at the center of our efforts to improve air quality. We were doing it before there was a Clean Air Act, and Congress has graciously allowed us to continue to do that when they established the 1970 amendments to the Clean Air Act and the Federal Motor Vehicle Control Program.

I think the whole country has benefitted as a result. We have lead the way in establishing technology-forcing standards for motor vehicles. Our standards resulted in the development and use nation-wide now of computer controlled catalytic equipped cars of the 1980s. These cars have quite low emissions, and simultaneously they have improved fuel economy and drive-ability.

The reason I point this out is that this same technology holds great promise for further emission reductions. Reductions of the standards that you are looking at in your bill will not require the new, innovative development of something like the catalyst or a computer, but we believe will be able to be achieved with refinements to this technology that has already been on the road on most cars for a decade.

We are taking advantage of the capabilities and promise of this technology to set a whole new set of standards for cars and trucks in California, and so I'd like to offer sort of a comparison of what we are doing to S. 1630.

In the area of cars and light trucks, beginning last year new cars and light trucks sold in California were subject already to a 0.4 gram per mile NO_x standard. Your bill would impose this nationwide in 1993. That technology has been demonstrated. The cost was very reasonable.

Earlier this year our board adopted a 0.25 gram per mile non-methane hydrocarbon tailpipe standard for cars and light trucks beginning with the 1993 model year, and the same standard has been proposed in S. 1630 for the same model year. When we assessed this standard, we found it to be feasible and cost effective.

Part of the basis for that standard was that we found cars today on the road that meet both of these standards right now. We're not saying all of them do. If they did that, we wouldn't have to adopt new standards. But, in fact, the technology is there and shows promise of all cars being able to comply with these standards.

S. 1630 also provides a second phase of standards. In 1995 you extend the useful life to 100,000 miles from its current 50,000 miles for cars. California adopted this requirement earlier this year. Considering that about 70 percent of the vehicles' emissions occur after 50,000 miles, and the fact that EPA has already required every other class of vehicles except cars to comply for their full life—up to 290,000 miles, in the case of heavy trucks—it seems like a change to full life compliance for cars is needed desperately.

You have established, in S. 1630, a second tier of standards for non-methane hydrocarbons and NO_x of 0.125 hydrocarbons and 0.2 NO_x for the year 2003. We have considerable optimism for meeting the 0.2 gram per mile NO_x standard. We have already committed, in the State implementation plan, to adopt such a standard for the late 1990s models. We are also evaluating a new technology called electrically-heated catalysts that we think offers some promise for meeting the 0.125 second-tier standard for hydrocarbons.

I can't tell you today that these second-tier standards are feasible. But, considering the potential of the current technology to further reduce emissions, considering the extremely low emissions of vehicles which are using the best controls today—we just tested a family of eight Nissan cars, same model, that are in customer use, and at 40,000 miles they emitted 0.11 gram per mile hydrocarbon. So that shows some evidence of hope for meeting these more stringent standards.

The other point is that whenever we have required compliance with emissions standards the industry and the ingenuity of the engineers have always come through and we have found that cars comply with the standards we have set. So we have kind of drawn

the conclusion that, given the second-tier standards are still 13 years away, if you establish such standards in law there is a darn good chance they will be met. And I think the corollary is that if you don't establish them in law, they won't be met—at least outside California where we are committed to adopting those type of stringent standards for the future in California.

On the cost of compliance with these more stringent standards, I think we have very good estimates of the first tier of standards being somewhat under \$100 per vehicle. I can't be as precise with the second tier, but we think it will be roughly another \$100 per car for the kinds of technology that we see emerging to meet the second tier of standards.

There are a number of other provisions in the bill that we find innovative and feasible. One of them is on-board diagnostics. Our board just adopted a requirement that vehicles be able to diagnose when they are out of compliance with emissions standards and warn the owner of that and help the mechanic diagnose the problem that is causing these high emissions. We have adopted that requirement for 1994 and newer models just last month at a hearing in front of the Air Resources Board.

We also are very encouraged by the requirement that off-road vehicles be regulated. This is a category of vehicles that often cross between State to State in major construction projects, and they are more difficult for California to regulate on their own.

The remainder of my testimony on fuels and inspection maintenance has been submitted for the record.

Thank you.

Senator BAUCUS. Thank you very much, Mr. Cackette.

Gentlemen, one of the basic questions, obviously, is, first, the feasibility of meeting higher emission control standards—let's say round two. There is general agreement that the technology today does not currently exist. The question is: if the provisions in S. 1630 do go into effect so that new technology is required by the year 2003 for round two, how much innovation would be necessary? Some suggest it would be fairly dramatic. Some suggest that it would be technology nudging—just changes in tolerances; that is, existing technologies refined can get the job done, and you don't need dramatic new—like you said, Mr. Cackette, something in the nature of a new computer or catalyst or cold fusion or something.

I'd like to kind of flush that out a little bit. I assume the industry feels it is pretty dramatic. And I assume Mr. Walsh and Mr. Cackette feel it is not so dramatic. I wonder if someone from the auto industry could address how dramatic of an increase in technology change it would be, and why.

Mr. BUIST. Senator, let me—

Senator BAUCUS. Quite briefly, because I don't want this to be a big, long debate here. Just try to get to the nub of the matter here.

Mr. BUIST. Okay. The nub of the matter is very similar to the accusations that were made that we were crying wolf in the 1970s. I'd like to readdress that just for a second, if I could.

Senator BAUCUS. Sure.

Mr. BUIST. It is one thing for someone to cry wolf and never have the wolf show up at the door. It is quite another thing to cry wolf and literally have the wolf show up. I think that's what happened

in the 1970s, and we're afraid that is going to happen again in the 1990s.

In the 1970s, we said we had very strong apprehensions about being able to put catalyst technology in place, and as a result it was pushed off to 1975. We got rolling in 1975 and the catalyst ended up being an extremely beneficial piece of technology that has worked well.

There was a second tier at that time very similar to what we are addressing today, which was a 1978 set of standards that dropped much lower. We said again at that time, similar to what we are saying today, 1978 is too early—we don't know how to do that second tier. Unfortunately, no one heard us or listened to us until we literally started building 1978 models. All three of us were stacking up 1978s in every vacant field in the Midwest we could find, and we were down here saying—and we were re-labelling them 1977 so we could sell them and move them out. And the government finally listened and pushed the standards back.

We don't want to get into that situation of the 1970s again in the 1990s. The 1970s were absolutely horrible times for us.

Senator BAUCUS. The point that I address is: from round one to two, how much of an increase in new technology would be required? And is it in the nature of nudging? Or is it in the nature of something—

Mr. BUIST. We think it is far beyond the nature of nudging.

Senator BAUCUS. Explain why.

Mr. BUIST. The issue really boils down to being able to hold that extremely low level for 10 years or 100,000 miles in the hand of the consumer. Once you get out beyond about four or five years where the vehicle value becomes relatively low, we pretty much lose control of the vehicle, as a manufacturer.

Senator BAUCUS. On that point I hear you, and it is probably harder to control the longer the life of the car. I think Mr. Cackette said, though, that 70 percent of the emissions are past 50,000 miles. Is that accurate?

Mr. BUIST. I wouldn't dispute the number. I don't know if the exact number is right, but I wouldn't dispute what he said.

Senator BAUCUS. But you're still addressing the difficulty of maintaining that control over 100,000 miles?

Mr. BUIST. That's right. And it is purely lack of technology, the reason I'm sitting here today saying we don't know how to do that. And we don't see that next catalyst on the horizon that we can say we even have hope to put on the vehicle to meet it.

Senator BAUCUS. Would that require a second catalyst?

Mr. BUIST. I was only using the catalyst as an example. I don't know that. Mr. Cackette is right when he speaks about some type of what he calls an electrical assist on the catalyst. The trick is to get the catalyst lit off and have it do its job as fast as possible, but we don't have that technology yet.

Senator BAUCUS. Would Mr. Walsh or Mr. Cackette like to respond to that same question?

Mr. CACKETTE. I'd like to respond.

There are three things that need to be done to further lower emissions. The first one is that you need to get emission control during the cold start of the car—the first minute of operation. The

second thing is that you have to have precise control of the amount of air and fuel going into the car. And the third thing is you have to have catalytic converters that last.

In the last five years, we have seen huge developments in the second and third aspects. Catalysts are more durable. They are resistant to abuse and high temperature and hot rod driving and things like that. We have seen advances in the control of the air and fuel such that it is becoming, with computer control, an extremely precise job that the cars are doing. Those two areas offer even more potential in the future.

The final one, the first item that I mentioned, is the cold start. That is where I mentioned the electrically heated catalyst. There are emerging technologies that would work in that first minute.

Senator BAUCUS. The question is: does it require dramatic change to reach round two? Or is it with refinements of current technology, technology-nudging changes?

Mr. CACKETTE. Number two and three are not dramatic. They are just refinements. Number one is somewhat of a dramatic change, but given the kind of time frame you have in your bill—13 years—it just seems to us that it is inevitable that those kind of controls—

Senator BAUCUS. Very quickly, Mr. Walsh—my time is up here.

Mr. WALSH. I agree with what Tom was saying. If you just look at the figure 27 in my submission you can see the in-use emission generally going down over time on the basis of GM's data. It is just this gradual improvement. As you tighten down on the three major parameters that Tom talked about, you will encourage a lot of this by your cold-temperature CO standard that is also in the bill—the 20 degree requirement.

So I think that we're not talking about any major dramatic new technology.

Mr. LEONARD. Senator.

Senator BAUCUS. I'm sorry, my time is up. Don't forget what you were going to say, because there will be another round of questions.

Senator CHAFEE. Well, I'll give Mr. Leonard a shot on my time. Go ahead.

Mr. LEONARD. Senator, there are two points I'd like to make. Number one, it is going to require dramatic improvements in technology for all of the reasons that Mr. Buist said. Number two, any time you have a deteriorating system, which is almost inevitable with a car that ages, you are going to see a greater percentage of its emissions of its life over the second half of its life than you are the first. And that's the whole premise behind the way the standards were set at 50,000 miles to begin with. It was acknowledged that the emissions for that vehicle were going to be below the standards for the first half of its life. It is going to be above the standards for the second half of its life. And the standard represents the average emissions of the vehicle over its life.

So any type of a deteriorating system will have a greater percentage of its emissions in the second half of its life than it will in the first half. That is absolute.

You're never going to change that relationship between the vehicle having more than 50 percent of its emission in the second half and less than 50 percent of its emissions in the first half.

Senator CHAFEE. I'd like the automotive people to address briefly the effect of stringent standards—and whether it is S. 1630 or S. 1490, let's not get into that. What is the effect of this on the world competitive position of our automobiles? There has been testimony that we are the leaders, that this is the market place of the world, and that if we make these requirements, then foreign producers also have to meet these requirements so our competitive position worldwide is not affected. Briefly, what do you say to that, Mr. Leonard?

Mr. LEONARD. For competitive purposes, our big push today is to export. In export-type situations, what you are looking for is commonality and harmonization of the standards of the world.

The standards of the world today are beginning to harmonize around the current U.S. standards. To the extent that we make dramatic leaps in the stringency of standards today, it will probably hurt our competitiveness.

Senator CHAFEE. Mr. Boltz.

Mr. BOLTZ. I agree. As more cars are required to meet the same standard, differential advantages in competitiveness are, if any, very small.

Senator CHAFEE. So you don't see a competitive problem for the U.S. selling overseas?

Mr. BOLTZ. Neither an advantage nor a disadvantage. We will tailor the vehicles to the standards in effect which are, overseas at least, quite a bit less stringent than present U.S. standards.

Senator CHAFEE. Following up what Mr. Leonard said, have we seen the foreign manufacturers or the foreign nations follow our standards here gradually with the requirement that the pollution emissions be reduced somewhat similar to the U.S.? Is that true or false?

Mr. BOLTZ. Well, I believe that all nations are concerned about clean air and the environment, Senator. And to the extent that they see other technologies emerging that they can take advantage of to clean up the environment in their countries, to the extent the United States has a leadership position, on average I would say yes.

Senator CHAFEE. Although I think it is true that the catalytic converter is not required in many of the countries.

Mr. BOLTZ. That's correct, but it is being introduced presently, and we expect that the rates of installation will increase in the future.

Senator CHAFEE. Mr. Buist, what do you say?

Mr. BUIST. I don't think there is any question the rest of the world is watching the United States with respect to automotive emission controls and, in effect, playing catch-up as fast as they feel they should. Europe is perhaps the leader outside the United States catalyst technology in Europe in the early to mid-1990s will be spread across Europe.

Senator CHAFEE. Let's pursue that a bit further. Is there any competitive advantage that has come to the United States by the fact that we have developed the catalytic converter? We put a lot

of energy in it and expertise—you gentlemen and your companies. Has that given you a lead in the manufacture of catalytic converters, or whoever your suppliers are? Has it been a plus, a minus, or a neutral?

Mr. BUIST. I'm not sure of your question.

Senator CHAFEE. I'm saying that you have put a lot of research into developing this instrument that has proven tremendously effective. Mr. Cackette has said that now the refinements and improvements on it have been dramatic. You have your hot rodders even that it works out well even with them.

My question is: Does that mean that it has opened a market for the United States in the foreign countries in selling very well manufactured catalytic converters? Has it, or hasn't it?

Mr. LEONARD. Senator, we sell catalytic converters abroad.

Senator CHAFEE. To foreign cars?

Mr. LEONARD. To foreign cars.

Senator CHAFEE. So it has been a plus?

Mr. LEONARD. That particular aspect of it has been a plus.

Senator CHAFEE. Don't be so reluctant to say so. Let's hear a good word here.

Is it a big plus, a little plus, or—

Mr. LEONARD. In the total course of our business, it is not a big plus. The things that concern us about more stringent standards today is the capital demands it will make on us which will detract from some of the other aspects of engineering that we're trying to do and capital improvements we're trying to do to improve our competitiveness against the foreign manufacturers.

Senator CHAFEE. Why not go as far as California on the NO_x ? I don't know which gentlemen it was—was it Mr. Boltz?—that said that by reducing the NO_x in some areas it might even cause a problem—Philadelphia and so forth, I think, you mentioned in your testimony. I'm not sure that's quite accurate. I have understood that through air transport it doesn't work. It may, in an immediate area, be a plus, but not nationally a plus. And it seems to me that what the nation of California demands of you, you must pretty well have to do for the rest of the country, don't you? Or, if you are manufacturing for California, you must be able to do it for the rest of the country.

Mr. BOLTZ. Senator Chafee, I believe the comment was actually made by Mr. Buist. However, I would like to make one note. The ARB's testimony indicated that four-tenths of a gram per mile is the present standard in California, and yes, it is. It was also imposed with a seven gram per mile CO standard. The two are inter-related.

The efficiency being the reducing catalyst that provides some NO_x control through the rhodium. Its efficiency is such that it tends to have a bit higher efficiency if we calibrate the engines to run a bit richer, which requires a higher CO standard. So as you contemplate the standards for HC, CO, and NO_x collectively, the technology—and particularly catalyst technology—gives us a very narrow window to oxidize hydrocarbons and CO—a very narrow window of efficiency.

If you want more NO_x control, there is some tradeoff, and California made that tradeoff in their statement within the last year or

two. Those will be tightened down. It will be very difficult to accomplish. It has not yet been accomplished. We are concerned about risks of increased rates of recall with the standards that will go into effect in 1993 and 1995, and indicated as such to California.

Senator CHAFEE. My time is up, so I thank you. I see the tradeoff point you make. Thank you.

Senator BAUCUS. Thank you, Senator.

Senator Durenberger.

Senator DURENBERGER. Let me ask you about reformulated gasoline. The auto industry has always told us that fuel characteristics are important for meeting tailpipe standards in use. What is the potential for reformulated gasoline? For instance, can we make progress in the direction of our second round hydrocarbon standards by cleaning up the fuel? What about the potential of possibly a completely different fuel—a methanol, or whatever?

Mr. LEONARD. Senator, I'd like to take the first crack at that.

The potential for reformulated gasoline is not so much in how much cleaner you can get the cars out in 2003, because they are pretty clean at that stage and the tailpipe emissions in that time frame are going to be less than 4 percent of the overall emissions of hydrocarbons in the country. The potential for reformulated gasoline is its ability to reduce emissions across the entire fleet in the field—all 160 million vehicles that are out there.

The ARCO announcement in California earlier this year is claiming benefits on our older—our pre-1975 passenger cars and our pre-1980 light duty trucks—in the neighborhood of 15 percent. If you can get achievements like that, that will apply to the unleaded gasoline, and if you can continue or make better types of achievements like that, you get immediate reductions across the fleet when that fuel is implemented, which gives you much more rapid progress and much broader-range progress than whether it helps achieve a 0.125 or not.

Senator DURENBERGER. Does anybody want to disagree with that?

Mr. BUIST. I would agree with that. Basically, I just want to make sure the Senators understand that we're not here to oppose the second tier. At least from Ford Motor Company's point of view, we are here to say it makes more sense to us that a second tier be an alternative fuels approach, and perhaps a reformulated gasoline approach if that proves to be as beneficial as, for instance, a methanol approach.

California, at least from our perspective, is clearly embarking on an alternative fuels approach, and perhaps that makes sense in some key other areas of the United States.

Senator DURENBERGER. Let me ask a second question. If each of you had to choose between the second round hydrocarbon standards in this bill—the 0.125—and on-board refueling controls, which would you choose?

Mr. LEONARD. Do I want to be shot or hanged?

Senator DURENBERGER. So we'll start with Chrysler.

Mr. BOLTZ. Thank you very much, sir. I think the choices really aren't limited to an either/or. I think we have to—

Senator DURENBERGER. Do you want to end right there?

Mr. BOLTZ. Yes, I would. I believe there are many other choices. Taking the system together, we view the Administration's proposal

for stage two, the tailpipe standards, and the alternate fuels proposals as a complete package. In fact, all the bills that we've seen are reputed to meet the national air quality goals. As a consequence, as I indicated in my testimony, it is the cost-effectiveness issue that is most important.

Senator DURENBERGER. Does anybody want to disagree with that.

Mr. BOLTZ. We believe that particular package is most—

Senator DURENBERGER. I've got a couple more questions. Does anybody want to disagree with that, or is that going to be the position? Mr. Walsh.

Mr. WALSH. I guess I would say, Senator, that I think that, unfortunately, with the kind of growth rates that we're seeing in vehicles, we're going to be looking at all of the above. It is not going to be an either/or because there are other choices. It is going to be all of the things, including alternative fuels, that I think are going to have to play a major role in cleaning up vehicles in the future.

Senator DURENBERGER. Third question: this bill modifies the warranty provisions on existing laws. For two items the warranties increase from 5/50 to 8/80, and that's the catalytic converter and the oxygen sensor. But for everything else, the warranty is reduced to 2 years and 24,000 miles. What is the view of the auto industry on those two changes.

It seems to me that the pollution control systems are much more complex and that more warranty coverage, not less, would be better for the consumer and the environment.

What are your views?

Mr. LEONARD. Senator, I know there is a lot of concern in the after market about the longer warranties, and that is something that the Senator and the Congress has to deal with. Generally, we honor the 5 and 50 warranty today. The problem with extending the warranty on the bigger components is the problem with any longer warranty, and that includes the other components, as well.

As you end up through the warranty system subsidizing the people that don't maintain their cars and forcing the people that do maintain their cars to assume the cost—because the warranty costs spread across everybody—and if the fault of the product is poor maintenance, then not having the longer warranty puts the cost where it belongs—on the person that fails to maintain his vehicle—and doesn't try to spread it over to those who do.

Senator DURENBERGER. Is that a generally-held view? Mr. Walsh?

Mr. WALSH. Senator, I think what the impact of the longer warranty on major cost components would be to encourage manufacturers to build more durable components. I think that's the intent of it. And I think that the result will be an overall lower cost to the consumer. I think it is cheaper to have a major cost item last for the life of the vehicle than it is to replace it at some point throughout that life.

Senator DURENBERGER. I want to ask a question, also—I'm sorry. I'm out of time.

Senator CHAFEE. We have been following the rule here.

Senator DURENBERGER. Yes. Right.

Senator CHAFEE. We'll get back to you.

Senator Lieberman.

Senator LIEBERMAN. Thank you, Mr. Chairman.

Mr. Cackette, there has been some controversy this morning beginning with Senator Levin—I'm sorry I had to go out for a while—about the various cost estimates here. You have weighed in with some cost estimates through the board. Do you know the basis for EPA's \$500 cost estimate for the second round of standards?

Mr. CACKETTE. Yes, I believe I do. I talked to them about it. The \$500 is made up of \$150 for an improved electrically-heated catalyst system. And the second piece is an assumption that the catalyst will have to be replaced at 50,000 miles in order to meet the second stage standard, at a cost of \$350. When asked what the basis for the assumption the catalyst would have to be replaced, the answer, if I could just sort of paraphrase a long discussion, was, "Well, that's all we could think of today as an approach that would potentially meet these standards today, not in the year 2003."

When I look at that, I don't see any basis for why the catalytic converter would have to be replaced. If you then eliminate that \$350 from the estimate, you end up with an EPA estimate of around \$150 for tier two standards. I estimated roughly \$100. Given the uncertainty, I think those are actually in very close agreement.

Senator LIEBERMAN. Just for the record, if you would, spell out the basis of your estimate of about \$100.

Mr. CACKETTE. Our rough estimate was based on the use of additional noble metals in the catalyst to meet the 0.2 NO_x standard. The use on some cars of something called exhaust gas recirculation, which has been deleted from many cars because catalysts are now so efficient, and the use for the hydrocarbon control of what we call start-catalysts—catalysts that work in the first minute of operation—it is hard to precisely estimate, as my testimony said, the value of each one of those, but it is on the rough order of \$100.

Senator LIEBERMAN. Let me ask you about one of the other points in controversy here, which was the 100,000 mile requirement. The auto manufacturers have said that when combined with other requirements in the committee bill, that this would be virtually impossible.

I know that you have recently looked at the 100,000 mile requirement and concluded that auto makers had the technology and the ability to design a durable car that would go for 100,000 miles. Can you discuss your analysis of California's 100,000 mile requirement?

Mr. CACKETTE. Yes. Our board adopted it after a day-long hearing just a few months ago. This was the area that gave the auto industry the most difficulty.

We provided for somewhat of an additional cushion beyond 0.25 hydrocarbons for that second half of the life. We actually established a standard of 0.31 at 100,000 miles, and we gave the manufacturers a phase-in period—some time to make a mistake and correct that mistake before they would have to meet their maker of the recall, which is so greatly and rightfully feared by the auto manufacturers. With those kind of provisions, with a little bit of phase-in and a little bit of recognition there might be some mistakes made the first go around, I think most of the manufacturers' opposition softened to the 100,000 mile standard.

When you look at it, they build light trucks today that are required to meet the standard for 120,000 miles. They build heavy

trucks where the standard goes from 150,000 to 290,000 mile life. Those are all full life standards.

The only category that does not currently have to meet full-life standards is cars. It is kind of hard to argue they can't do it for cars when they are doing it for trucks.

Senator LIEBERMAN. I'd invite a response from some of the representatives of the auto industry to that last point. Maybe I'd state it in a context, too, if I could, briefly, which is that we now have this series of higher standards being put in place by California. We have the Northeast States that are adopting a series of higher standards that presumably you'll live by. Why not have Congress go up to that same level?

Mr. BUIST. Let me attempt to answer that, Senator.

We've talked a lot with the Northeast States, and we've indicated to them that you're really addressing the California 1993 standards—the standards that were put in place for California. You're talking about adopting those standards in 1993. Now, those are a set of standards that are in place for a California unique situation, which is oxides of nitrogen that are out of compliance. Oxides of nitrogen are in compliance in the rest of the nation, effectively.

So on top of that, the issue that scientists are beginning to pretty much agree to is that you have to keep this hydrocarbon/ NO_x ration in line or what will effectively happen: as you reduce NO_x , you increase ozone. Those are the issues we presented to the Northeast States. We never said we couldn't sell the California car there. We obviously would be able to sell whatever we can sell in California. The question is: are you really going to get a bang for your buck in the Northeast with respect to ozone reduction? That's the issue we raised.

Senator LIEBERMAN. I understand. If I may follow up briefly on that: basically, what I'm saying is that if you have California doing what it is doing, the Northeast States, it seems to me from what I heard—and I live there—are going to do pretty much the same. Then you're dealing with a situation where—I've forgotten for the moment the percentage of cars that are purchased in the Northeast and California, but it is high. Why have two standards? Why not have Congress bring the Nation up to that level, as well?

Mr. BUIST. The difference is the oxide to nitrogen standard, and our only issue there is: is that needed on a national basis?

Senator LIEBERMAN. My time is up.

Senator BAUCUS. Mr. Buist, on that last point I thought I heard you say that a decrease in nitrogen oxide emissions would increase ozone.

Mr. BUIST. It could, depending on the atmospheric situation in a particular city.

Senator BAUCUS. It is my understanding that some models do so conclude, but first of all the only empirical data we have—and Mr. Cackette perhaps can document this—is in California. That's the only area in the country where there is empirical documentation of the fact. I could stand corrected, but I think evidence in California is just the opposite; that is, even though spikes in nitrogen oxide emissions may have the adverse effect, over the long haul the exact opposite is the case—increases in nitrogen oxide do have the effect

of increasing urban smog over the longer haul, not decreasing. And, in fact, that is what OTA says.

Mr. BUIST. I think—

Senator BAUCUS. If I might, let me just read a sentence from an OTA report. It says:

Though NO_x reductions can have either a beneficial or a detrimental effect on peak ozone concentrations in nonattainment areas, they will most likely lower both acid deposition and regional ozone concentrations.

Mr. BUIST. My response to that is that basically—well, two points I'd like to make. One, it is our understanding that, as I think Tom would agree with this, even in the L.A. basin they found that there were areas in the basin that, when you lowered NO_x levels, you actually increased ozone.

Senator BAUCUS. Let me just ask Mr. Cackette. Should we lower NO_x levels or not? You're from California.

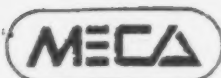
Mr. CACKETTE. Well, I can only answer for California. We concluded that lowering NO_x in the aggregate would benefit ozone. But there is another point in why NO_x control is important: NO_x emissions contribute to a number of environmental problems. They are a major contributor in many areas to PM-10. They turn into fine particles in the air, and there is a national control program required for PM-10. In some areas—particularly in the west—they are a major part of our acid deposition problem. Over half of the acid deposition is nitrogen oxide related, and nitrogen is a compound which, in the atmosphere, forms a lot of carcinogenic compounds, as well. So there are a number of reasons why NO_x is a bad pollutant, and we control them for all those reasons.

Senator BAUCUS. I'd like to further address the tier two cost question. Senator Lieberman asked Mr. Cackette the basis for Mr. Cackette's analysis that tier two, in his judgment, would cost roughly \$100. Some of you from the automobile industry have suggested that EPA concludes it would be about \$500. I must say I asked Administrator Reilly his basis for that \$500—particularly whether the EPA consulted with the supplier manufacturing industry, and his answer to me was no, they had not. There was no strong—to say the least—evidence that there had been a dialogue between the EPA and the automotive suppliers. That's important because we have evidence—in fact, a letter from them—saying that, in their judgment—in fact, I'll put the letter in the record. This is a letter to Mr. Rosenberg at EPA dated September 25th of this year from Mr. Bertelson, Executive Director of the Manufacturers of Emission Control Association.

I'll just paraphrase the letter. It says that they believe very strongly that they can do better than that \$500 for tier two.

So I'd like to, as Mr. Lieberman said, invite the industry to comment. Here it is the industry, itself, that supplies a lot of it, that says that it can do better. Mr. Cackette gives the basis for why he thinks it can do better. I'm just curious why you think we cannot do better than \$100.

[The letter referred to follows:]



Manufacturers of Emission Controls Association
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September 25, 1989

Mr. William Rosenberg
Assistant Administrator
for Air and Radiation
U.S. Environmental Protection Agency
401 M Street, N.W.
Washington, D.C. 20460

Dear Mr Rosenberg:

We wish to thank you again for the opportunity to meet with you and members of your staff. At our meeting you asked that we comment on the technological feasibility and costs of the Tier I and Tier II emission standards contained in H.R. 2323 for passenger cars. At our meeting we also discussed our industry's views and concerns regarding proposals in the Administration's bill to amend the Clean Air Act which would introduce a comprehensive averaging scheme and would roll back the 1991 0.1 g/BHP-hr particulate standard for buses until 1994. All of these items are discussed below.

Technological Feasibility and Costs of the Tier I and Tier II Standards

Feasibility of Tier I Standards -- H.R. 2323 would establish Tier I standards of 0.25 gpm HC, and 0.4 gpm NO_x for passenger cars while retaining the current 3.4 gpm CO standard. We believe that with further development and refinement of well understood control technologies and reasonable lead time, these standards are achievable for 100,000 miles.

The final technical solution for meeting the Tier I standards will not simply be a better catalyst, but rather a complete system with advanced catalyst designs and improved engine controls such as multi-point fuel injection.

The greatest engineering challenge to complying with more stringent emission standards is maintaining the durability of the control systems in use. We believe that (1) improvements in catalyst design, either in existence or under development, (2) utilization of multi-point fuel injection and other engine improvements, and (3) a declining presence of trace lead in unleaded gasoline make the prospects for developing durable systems excellent.

To help insure that control systems designed and built to meet more stringent standards function effectively, the vehicles should be properly maintained. Effective in-use emission control programs such as I/M emission testing and anti-tampering inspections will provide added incentive to vehicle operators to properly care for their vehicles.

A number of promising approaches have been or are being developed which could achieve greater NO_x and HC control than currently required. For example, several of our companies have developed, or are developing and testing, advanced catalyst formulations with enhanced control efficiency and durability characteristics. New generation three-way catalysts, for example, feature open porous surfaces more resistant to performance deterioration and incorporate materials which enhance the active catalyst performance.

Since the key to greater HC and CO control is to maximize emission control during "cold start", a major focus of our member companies' engineering efforts has been in developing catalyst formulations and substrates for use in a close coupled position as light-off converters where operating temperatures will be higher than experienced in the current under body position. Our companies are also developing catalyst formulations which are more active at lower temperatures to improve emission control performance of converters located in the underbody position.

Proper performance of the catalyst is dependent on the system in which it operates. Three-way catalysts will operate more efficiently in the exhaust of a tightly controlled air/fuel metering system. Multi-point fuel injection, improved ignition systems, computerized engine controls, improved oxygen sensors, and better air flow management, which increasingly are being used, will help maximize catalyst efficiency and durability and facilitate compliance with the proposed standards.

As noted above, the most serious engineering challenge to meeting more stringent emission standards is to maintain emission control performance during the useful life of the vehicle under real-world operating conditions. We believe any remaining engineering challenges can be addressed. But, for the emission control systems to perform effectively, the vehicles should be properly maintained.

With regard to durability of the catalytic converter, the primary engineering challenge is maintaining conversion efficiency in a hostile environment in which the catalyst is sometimes subjected to extremely high exhaust temperatures as well as exposed to contaminants from the fuel (e.g., lead) and oil (e.g., ash). Substantial advances in catalyst design have been made since catalytic converters were first introduced in

1975; indeed many of the catalyst designs found on 1989 model year vehicles are superior to those found on vehicles sold in the early 1980's.

Our companies have developed, and are continuing to develop, improved catalyst supports (substrates), washcoats, and catalyst formulations which are better able to withstand exposure to the extremely high temperatures sometimes experienced in vehicle operation. For example, work is continuing to develop catalyst substrates with greater resistance to melting than the material used in the majority of today's catalytic converters. Also, companies have developed and are working on new washcoat materials that are more resistant to sintering at high temperatures.

Work is also under way to make catalyst systems more resistant to contamination. For example, research is taking place to develop washcoat materials with better porosity and to develop methods of chemically bonding the contaminants such that they do not effectively poison the precious metal active sites.

Other developments are occurring which should improve in-use catalyst performance. First, as noted above, improvements to the fuel control and ignition systems will better regulate the engine operating conditions permitting the catalyst to function in a more controlled environment, thereby improving catalyst performance. Other engine improvements help reduce engine emissions generated by malfunctions. Second, and very important, the level of the principal contaminate contributing to catalyst deterioration in-use -- lead -- has, over the last several years, significantly decreased in unleaded gasoline. Such reductions in trace lead levels in unleaded gasoline have had an extremely positive impact on increasing catalyst durability. As lead contamination levels in unleaded gasoline continue to go down, catalyst durability will continue to improve.

Feasibility of Tier II Standards -- H.R. 2323 calls for a further tightening of passenger car and light duty truck standards (0.125 gpm HC, 1.7 gpm CO, and 0.2 gpm NOx) beginning with model year 2000.

Meeting the standards proposed by H.R. 2323 for model year 2000 likely will require even greater control of cold start CO and HC emissions, and more durable catalysts and control systems. The technological solution will likely involve the further optimization and utilization of the control technologies used to meet the initial standards contained in H.R. 2323. Cleaner oil and gasoline fuel would greatly facilitate compliance with the Tier II standards. Efforts by the oil industry to develop "reformulated gasolines," if successful, may also play a role in reducing emissions. On-board diagnostic controls, such as those covered by regulations adopted this month by the California Air

Resources Board, would also help achieve such levels over the useful life of the vehicle. For example, certain diagnostic controls will identify engine malfunctions which, if left unattended, could damage the catalyst. By identifying the problem and fixing it before the catalyst is damaged, catalyst durability can be maintained.

While the technological challenges in meeting the Tier II standards are considerable, the past accomplishments in emission control, the pace of current technological developments, and over a decade in lead time to develop technological solutions suggest that meeting these levels by the beginning of the next century is not beyond reach technologically.

Costs of Compliance with Tier I and II Standards -- Since our companies manufacture only a part -- albeit an important part -- of the complete emission control system, our companies generally refrain from commenting on the cost to the ultimate consumer of a complete control system. In order to be responsive to your request, however, we offer the following general observations.

With regard to the Tier I standards, CARB estimated the cost of the 0.4 NO_x standard it adopted at about \$25 to \$35 per vehicle. CARB estimated that the average per vehicle cost of adopting its 0.25 NMHC and 3.4 CO at approximately \$65. Other studies have similarly concluded that the cost of meeting emission standards in the range of the Tier I standards in H.R. 2323 are around or under \$100. It is our view that these estimates of the cost of the complete control system to the ultimate consumer are not unreasonable.

With regard to the costs of complying with the Tier II, standards your staff suggested at our meeting a cost figure of \$500. This rough estimate was based on a hypothetical control strategy which would use an electrically heated light-off catalyst (EPA staff estimate: \$150) and include an in-use replacement of the main catalyst (EPA staff estimate: \$300). While the staff's suggested control strategy would be one approach to meeting the Tier II standards, we believe that with over ten years of lead time available, more optimum and cost effective control strategies would be pursued. For example, as catalyst manufacturers our members' research and development efforts would be directed at products which would make catalyst replacement during the vehicle's statutory useful life unnecessary. While electrically-heated catalysts may play a role in meeting Tier II standards, it is by no means clear that every vehicle will require such controls to meet Tier II standards. Consequently, we anticipate that the costs of complying with the Tier II standards in 1989 dollars would be considerably below the preliminary cost estimates suggested by your staff at our meeting.

1991 Bus Particulate Standard

As we discussed at our meeting, recent developments in diesel particulate control have been remarkable. One of our members, Donaldson Company, Inc., recently announced its plans to offer diesel particulate trap oxidizers which will enable buses to meet the 1991 0.1 g/BHP-hr particulate standard. The Donaldson announcement is illustrative of the tremendous progress made in this country and abroad with diesel particulate trap oxidizer technology and confirms once again that technology forcing standards work.

We are extremely concerned that at the very moment a technological solution to cleaning up diesel buses appears to be close at hand, EPA is contemplating a three-year delay in implementing the bus standard. We believe such a delay is unwarranted, would send precisely the wrong message to engine manufacturers and control system manufacturers who are working on control devices, and would result in needless excess particulate emissions in our urban areas.

Proposed Averaging Program

President Bush's legislative proposals for amending the Clean Air Act would promote the wide spread use of averaging to determine compliance with emission standards. We have serious reservations regarding such proposals. As we discussed during our meeting, we believe an "averaged" standard allows for greater emissions than a standard under which every vehicle must comply.

Currently, vehicles are designed and certified such that taking into consideration production variability the highest polluting vehicle manufactured will still meet the standard. Thus, every car built should emit at or well below the applicable standard. With averaging, some cars can be designed and built to emit above the standard as long as the fleet on average meets the applicable standard. Clearly, greater emission reductions will occur if every car is built to meet the standards, as currently required by the Clean Air Act, than if only some of the cars meet the standards.

Engine family averaging, which requires each vehicle to meet some emission limit (i.e., the engine family emission limit), eliminates some, but by no means all, of the shortcomings of emission averaging. Currently, vehicles in certain engine families are controlling emissions well below the applicable standard. Engine family averaging creates an incentive to take "paper credits" for such emission reductions which would have occurred in any event and use them to certify other engine families above the applicable emission standards. The use of

emission banking and trading, which would be permitted under the President's proposal, will only add to the shortcomings of averaging.

If tighter emission standards were adopted, but engine family averaging were permitted, including trading and banking of emission credits, we believe it would be possible to equip vehicles in some engine families with less sophisticated emission control equipment than currently are used to meet the existing standards. This could occur because a manufacturer could accumulate sufficient emission credits to enable it to select an engine family emission limit for a particular engine family above the current standards and sufficiently lenient to allow the use of less sophisticated control systems.

In addition, rather than encourage innovation, we believe averaging will discourage research and development efforts by emission control manufacturers because averaging, particularly combined with trading and banking, creates substantial uncertainties regarding what the market will be for a given technology. The emission control industry made substantial research and capital investments after passage of the 1970 Clean Air Act because Congress established specific standards which created regulatory certainty that a need for control products, once developed, would exist. With averaging, trading, and banking that certainty is eliminated.

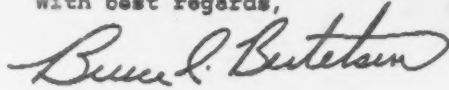
Finally, we believe that in-use enforcement of the emission standards, particularly with regard to recall, inspection and maintenance program, and emissions warranties under an averaging scheme will be difficult if not impossible. An averaging scheme under which individual vehicles need not meet a specific emission level is completely inconsistent with the existing motor vehicle in-use compliance program -- a compliance program which has demonstrated its effectiveness over the past two decades. Recall, warranties, and I/M inspections are all based on evaluating (and requiring the manufacturer to correct if necessary) individual vehicle emission control performance.

While engine-family averaging at least provides an emission limit against which individual vehicle performance can be evaluated, such a scheme would still hamper the effectiveness of the in-use compliance program. Averaging, particularly with trading and banking, will be a complex program to administer and enforce, placing a strain on EPA financial and human resources. Faced with a full range of engine family emission limits, we believe recall, warranty protection, and I/M programs will become more difficult to administer.

We hope the discussion above is responsive to your requests for our input. In closing, we wish to emphasize that while there may currently be certain areas in which we may disagree with the

Administration's regulatory proposals, we are committed to work with EPA, as we have in the past, to make the U.S. mobile source emission control program as effective as possible.

With best regards,

A handwritten signature in dark ink, reading "Bruce I. Bertelsen". The signature is fluid and cursive, with the first name "Bruce" and last name "Bertelsen" clearly legible.

Bruce I. Bertelsen
Executive Director

Mr. LEONARD. Mr. Chairman, I'd like to start by making one comment. The emission control industry—and specifically the manufacturers of the catalyst—have never guaranteed the performance of their catalyst to us. They have guaranteed the specifications, but not the performance. And it is the overall performance of the vehicle catalyst system that determines our compliance.

With respect to the costs for the second—

Senator BAUCUS. But you're not going to buy the stuff if it doesn't do what it is supposed to do.

Mr. LEONARD. But they're not going to lose anything if nine years out it doesn't make it, and we will.

The second point I'd like to make is: as an engineer, I am a firm believer in the law of diminishing returns. We have not been able to come up with a cost estimate, and I can't tell you one today for the second tier standards, because we don't know how to do it. But, as a firm believer in the law of diminishing return, it cost us in excess of \$500 to do the first 96 percent hydrocarbon control. The estimates I have seen for the next percent, which is the President's bill—the next 1 to 2 percent—is in the neighborhood of \$200 per vehicle just for that next 1 to 2 percent.

The law of diminishing returns generally holds true. It means that that last 1 percent to get down to 99 percent control in the tier two standards, the costs are going to be much, much higher than the \$200 that we're seeing for the tailpipe provisions of the President's bill.

Mr. BUIST. Senator, could I speak to that issue?

Senator BAUCUS. Sure.

Mr. BUIST. We're like General Motors. Ford does not have a price that we can put on the second tier. And we have struggled with how to answer that question to give you as much information to reach your decisions as possible.

We looked at EPA's analysis of the cost of reducing VOC emissions, and EPA indicates that they use an upper limit of \$2,000 a ton as a reasonable approach to VOC reduction.

If we use that number in relationship to the second tier reduction—and whether it is \$200, \$100, or \$500—let's say it is the bottom one, \$100—that works out to be about just under \$12,000 a ton. Our conclusion from that is: even if it is on the lower end of the cost, it is still an extremely expensive step to take. We feel a more realistic—now, that's an expensive step to get about another 2 percent.

We think a less expensive approach would be an alternative fuels approach where you get a very large amount of reduction for a relatively smaller amount of money.

Senator BAUCUS. Well, if there is a 2,000 per ton limit, I'm just curious how EPA would justify a 66,000 ton for—according to OTA, that's what methanol emissions reductions would cost.

Mr. BUIST. I'll have to look at the numbers, Senator. I'm not familiar with it.

Senator BAUCUS. My time is up.

Senator Chafee.

Senator CHAFEE. Mr. Buist, following on, you're the only witness here who has talked about alternative fuels to any degree, and you indicated that your company is prepared to go ahead. My question

is: do those alternative fuel vehicles that you have planned—I don't know how far along you are with them—how do they do in accomplishing the second round standards?

Mr. BUIST. The advantage of an alternative fuel like, for instance, methanol, is its relative reactivity in the atmosphere. In other words, it contributes far less to the formation of ozone than today's gasoline emissions, as we know gasoline today. That's the big advantage of methanol over gasoline, for instance. And that's, from what I can see, the next step approach that California appears to be going toward for the Los Angeles area because of that far less reactive emissions.

Senator CHAFEE. So, in other words, you believe that using methanol in your engines you would meet the second tier standards?

Mr. BUIST. No, I didn't say that, Senator. What I'm saying is that you keep the standards—let's talk hydrocarbons. You keep the standard at 0.25, and then you go to methanol. You, in effect, even though you meet the 0.25 standard, you have established a lowering or a second tier standard which is much lower—in the area of perhaps 50 percent lower—because of the reactivity. It forms half the ozone.

Senator CHAFEE. Yes. Now, the only trouble—not to bring you bad news, but I'm sure that Mr. Cackette knows this—is that methanol produces formaldehyde, doesn't it? Isn't that right, Mr. Cackette? One of the down sides?

Mr. CACKETTE. Yes. Yes and no. I don't believe it is a down side for methanol. Yes, it does produce more formaldehyde.

Mr. BUIST. Senator, could I speak to that?

Senator CHAFEE. Sure.

Mr. BUIST. There is no question that methanol produces more formaldehyde than gasoline engines today. California's approach with formaldehyde—and Tom can correct me if I'm wrong—it is my understanding their approach is to establish formaldehyde levels at effectively close to today's gasoline vehicles. So when methanol comes into California, if it does, they can say formaldehyde is no higher than had it not come in.

If we step up to methanol, we'll have to step up to lower the formaldehyde levels by some form of technology, and we're embarking on that road right now.

Senator CHAFEE. Mr. Leonard, neither you nor Mr. Boltz have commented on the alternative fuels. How do you feel about it?

Mr. Leonard, I've got to go vote in two seconds, so—

Mr. LEONARD. We also have demonstration programs with the State of California where we are testing variable fuel vehicles, and we are getting engineering expertise with those system to determine what the problems are and what the fixes are. And there is potential for the future with them.

Senator CHAFEE. Mr. Boltz, same thing?

Mr. BOLTZ. The alternate fuels program contributes to the cost effectiveness of your bill, sir. And, as a consequence, we support it. We have clearly not picked an alternate fuel, whether it be reformulated gasoline, whether it be methanol, or CNG. The leading candidates appear to be, at this time, reformulated gasoline and methanol. Much work will have to be done to sort the relative merits of those two fuels with EPA's assistance.

Senator CHAFEE. Why don't you gentlemen wait right there, because Senator Durenberger is on his way back. You can relax, but he'll be back shortly. We need to vote.

[Recess.]

Senator CHAFEE. I just wanted to ask a quick question about on-board canisters. There was a good deal of concern expressed about those.

The chart that Senator Levin had showed they are quite effective if you take cost effectiveness. I don't know how many of you saw that chart. Could you just comment briefly on that, Mr. Leonard?

Mr. LEONARD. Yes, Senator. To begin with, they are totally cost ineffective in conjunction with stage two.

Senator CHAFEE. They are what?

Mr. LEONARD. Totally cost ineffective. They have an infinite cost effectiveness because the use of on-board controls with a stage two system, which is a service station system, actually results in increased emissions because of the interaction between the two.

So if they are done in conjunction with stage two, they are infinite cost on a cost-per-ton basis.

Senator CHAFEE. In other words, you say that if—let's assume we're going to go ahead with a stage two, which cost gets all automobiles, regardless of when they're manufactured, which is a big plus.

Mr. LEONARD. Let me define my terms. Stage II that I'm talking about is the refueling control that's put on at the service station.

Senator CHAFEE. Right. That's right. What I'm saying: with the stage two you don't have to wait for the car to come along that has the on-board canister.

Mr. LEONARD. That's correct.

Senator CHAFEE. It affects all automobiles, regardless of when they were manufactured—if they were manufactured in 1985, for example.

Mr. LEONARD. That's correct.

Senator CHAFEE. So there is a big plus for the stage two.

Mr. LEONARD. The second plus is—

Senator CHAFEE. But you're saying if you have on board plus stage two it is totally duplicative?

Mr. LEONARD. It is worse than totally duplicative, Senator, because the control you get from the two combined on the stations that have it results in a net increase in emissions at those stations.

Senator CHAFEE. Any argument to that? What do you say to that, Mr. Cackette?

Mr. CACKETTE. If you have stage II, then we don't think it makes a lot of sense to have on-board, as well.

Senator CHAFEE. You've got stage two?

Mr. CACKETTE. We have stage II.

Senator CHAFEE. Do you agree, Mr. Buist?

Mr. BUIST. Yes, I would agree. It is frustrating. Stage two is clearly demonstrated in California. It works beautifully, and basically the State is happy with it. A big benefit, obviously—Senator, you made the comment—it can be done in a very short period of time.

Senator CHAFEE. Okay. Senator, go ahead.

Senator LIEBERMAN. Thank you, Senator.

I have a couple of questions. Mr. Walsh, I know that you are aware that the so-called averaging approach of the President's bill has been a source of controversy. When Administrator Reilly testified before us, he said that his proposal for averaging would limit the averaging to within what he called "engine families," and that that limitation would prevent the kinds of emission increases that we have been worried about and people have speculated about. I wonder if you could give us your reaction to that argument, and then also deal secondarily with the concern that has been expressed that the averaging concept will have a bad effect on the ability to recall.

Mr. WALSH. Yes, Senator. I think that if one were to have averaging, the best averaging to have—but there is no guarantee in the President's proposal that this is the one you would end up with, but the best one to have, from an environmental perspective, is one where you set a standard for each model that it has to meet throughout its lifetime, and that it would be subject to certification, assembly line testing, and recall, subject to those standards.

Even with that best program, I think that the likelihood is that overall emissions would be higher than if you have an every vehicle has to meet standards approach, which is the way I believe the current law is written.

The reason for that is several factors, some of which are technical and some of which are just kind of real world realities. One of them is that I think because of the importance of each engine family in that kind of a scenario, it will be very important for EPA to be sure that the "clean cars" are meeting their clean standards, as well as the dirty cars meeting their dirty standard.

That means that EPA has to, in its recall enforcement program, be focusing on all engine families equally, rather than the way it focuses recall now, for example. It tries to make judgments about which engine families are most likely to be dirty ones.

With the kind of resource constraints that EPA has operated under, and is likely to operate under in the future, I think that the net effect would be a poor enforcement of the given standards.

Secondly, I think that it flies in the face of sort of the compact that now exists that when you buy a car you are getting a clean car. Some people, under that scenario, are going to get clean cars; and other people are going to get dirty cars. And that's going to be okay.

The real world effect of that, I think, is that it is going to be harder to have rigorous and stringent inspection and maintenance programs, which I think are a very important part of the overall in-use compliance.

And, finally, I think most of the people at this table have, at various times, pointed out that the recall program is the major in-use compliance activity with which manufacturers have to be concerned about. When you have an averaging program that enables—as this one would—a manufacturer, if he fails to meet the standard in the field, to say that instead of fixing these cars and instead of having to go through the painful process of a recall and the deterrent impact that the painful process results in, instead I will clean up next year's cars another tenth or whatever gram per mile. It is, by its very nature, a less painful solution and, therefore, less of a

deterrent. And I think it will encourage manufacturers to try to get much closer to the line than they might otherwise be willing to be.

So for all of those reasons, I think averaging is a bad idea.

Senator LIEBERMAN. I appreciate your answer.

Let me pose a question to representatives of the auto industry, and let me introduce it this way: in part, what you are saying to us is that the auto industry has actually done a lot to clean up cars, since the original Clean Air Act. And that is a fact. Part of the problem—and why we come back to you to do more—is that to a certain extent we have been running to keep in place for a reason that is obviously good news for all of you, which is that people are buying more cars and they are driving them more miles. All the projections that we see on this committee of increases in air pollution come from that fact.

As a result, the committee has included within its bill some measures that we call transportation control measures. They're not rigid. They're not mandatory. But there is an attempt to join transportation planning with environmental planning and to put some responsibilities on State and local governments and, in some cases, on private employers.

I understand that, in a way, I'm asking you whether you are in favor of selling less cars, which is a question that I suppose answers itself from your point of view. But how do you respond to that? This is the problem under the problem. Let's accept the fact that you've made the cars a lot cleaner. I don't think we'd be pressing you as much today if you weren't selling as many cars and people weren't driving them as far.

Mr. LEONARD. Senator, could I address that one? Let's shift the focus right now from what the per mile rate is to what the overall emissions rate is—the overall emissions loading into the atmosphere.

Between 1978 and 1987, according to the EPA national inventory, mobile sources reduced the emission load to the atmosphere by 36 percent in hydrocarbon. That's despite VMT growth, that's despite more number of cars, that's despite the fact that we now, for the first time in our history, are at one car per licensed driver. We reduced the overall loading to the Nation by 36 percent. That compares to 9 percent for the stationary sources.

The next point is: what are we doing in the coming years? We're not standing up here asking to do nothing. The President's program, in conjunction with the fleet turnover, is going to provide impressive gains not only on a per vehicle basis, on a per mile basis, but in a total loading basis.

Administrator Reilly testified at the hearing Tuesday what the projected loadings in nonattainment areas were. Currently, under 2005 without the Administration bill and in 2005 with the Administration bill—and this includes projected VMT growth, projected growth in the number of cars and the projected growth in how many miles those cars are driven—that projection says there are about six million tons emitted in the nonattainment areas currently. Without a bill, just through fleet turnover and through the volatility controls that are already in place, that's going to be reduced to about 3.6 million tons in 2005. And with the President's bill, in-

cluding VMT growth, it is down to less than 1.4. That's almost a 75 percent reduction not in the per vehicle emissions, not in the per mile emissions, but in the emissions loading to the atmosphere.

Senator LIEBERMAN. So does that lead you to the conclusion that we don't need to do anything to get people to drive less into urban areas, for instance? We don't need to do anything to stimulate high occupancy vehicle lanes or ride sharing or mass transit?

Mr. LEONARD. Again, that is a decision that has to be looked at, I think, on an individual basis for the individual cities involved, and has to be compared against other methods of control.

What the President predicts under his bill, what the Administrator predicts under his bill, is that by 2010, with the transportation control measures that are in that bill, all the cities will be in attainment.

Mr. BOLTZ. If I may, Senator, I'd like to answer that latter question, as well as tie a few points together from our testimony.

What Sam has just said is that the 6 million tons to 1.4 million tons is the 75 percent reduction that I mentioned. As we understand it, the bill is going to result in the achievement of the national clean air quality goals. We are not here today, Senator, to advocate that we stand pat with present tailpipe standards. I am here from Chrysler to commit our support to S. 1490. That was said in our testimony.

We believe that the standards established are important. We believe that they will be cost effective.

Although both bills would achieve, in essence, the identical result, I want to underscore Sam's point. In some locations of the country problems are so severe that neither of those bills are going to solve them. One bill will impose far greater costs on the American public, to the tune of \$6.5 billion. Those monies might be better spent solving individual, local problems. And if that, indeed, requires some restrictions on transportation in those communities, I'm afraid that is something we're going to have to study very, very hard with those communities, with the EPA and with the Department of Transportation. We would hope to preclude it.

Senator LIEBERMAN. I appreciate your answer. I'd love to talk about it more with you, but my time is up.

Senator Durenberger.

Senator DURENBERGER. I think we're getting to the point where all these questions we have are terrific questions—and I'm impressed by the quality of the questions, as well as the responses. I have three quick ones I have to ask.

Mr. Cackette, I want to correct one part of your testimony. Our second round hydrocarbon is not non-methane hydrocarbons. It is total hydrocarbons—0.125 total hydrocarbon, which is more than a 50 percent reduction from the total hydrocarbon standard of 0.31, which applies in 1993 under S. 1630. So I would just ask you if the fact that our bill says total hydrocarbons at 0.125 rather than non-methane hydrocarbons changes your testimony in some way.

Mr. CACKETTE. No. As I said, I can't point to the technology that will exactly meet those standards in the year 2003 now, so I can't say that it is technically feasible. But I would still think there is substantial hope that the technologies we see developing would

meet 0.125 non-methane, 0.125 total—something in that general range of numbers.

Senator DURENBERGER. I think I recall a little while ago Senator Lieberman asked you about tailpipe standards in California for NO_x . I may or may not be correct. But there is one thing I missed, if he asked you. I have the understanding that California might eventually go to a second round on NO_x . Are you thinking about 0.2 grams per mile for 100,000 miles, as we have in our second round? Or are you thinking something higher than that?

Mr. CACKETTE. We have committed to adopt a standard like 0.2 in the State implementation plans on the South Coast. It was recently approved by our board and submitted to EPA for the late 1990s. Our board hasn't done it yet, but they have approved a plan that would have the staff bring that proposal to them in the next few years.

Senator DURENBERGER. My last question deals with carbon monoxide standards. The question is: do you believe there is a need to cut the carbon monoxide standard from 3.4 GPM to 1.7 as the second round of our bill proposes? I understand that California, until recently, had a higher carbon monoxide standard than the Federal standard. And, given that history, is your recommendation, or the California recommendation, that a Federal CO tailpipe standard of 1.7 GPM is appropriate?

Mr. CACKETTE. I should say first that we had a seven gram CO standard until recently. We still have it in effect. We have adopted 3.4 now for the 1993 model year. We had that higher standard because there was a very substantial NO_x and CO tradeoff. That tradeoff does not exist any more to a substantial degree, which is why we lowered our standard to 3.4 for California. I can't assess the rest of the country. I haven't done that. For California we do not see a need to go below 3.4. The reason for that is when you get hydrocarbon control out of the tailpipe, almost inevitably you get CO control at the same time.

Even though we had a standard of 7.0, our cars were actually certified cleaner than the Federal cars that were designed to meet 3.4, and that was because of our tight hydrocarbon control program. So we think hydrocarbons will do it for CO for our area.

Senator DURENBERGER. So if we didn't take it down to 1.7, you're not likely to? If we stay at 3.4, California is not likely to go—

Mr. CACKETTE. Yes, that's true.

Senator DURENBERGER. Thank you very much. That's all the questions I have.

Senator LIEBERMAN. Thank you, Senator Durenberger.

Obviously, we could go on most of the day with this panel. We appreciate very much the quality of your testimony, your patience in being here. I, too would like to submit some written questions to you all to be included in the record. Thank you very much.

We will now call the next panel: Jed Mandel, Emmett Barker, Bruce Bertelson, Donald Randall, and Don Beckett.

Gentlemen, we thank you for your patience, and we are delighted that you have been able to come and testify today.

I am able to stay until 12:30, and I understand that Senator Durenberger is able to stay until 1:00, so that will allow us to at

least get in your opening statements and some questioning before the break at 1:00.

If I may, with leave of my colleague from Minnesota, exercise the prerogatives of the Chair, which I temporarily occupy, ask a question before the prepared testimony, because it has been battered around so much here today and I'm very interested in the answer.

Mr. Bertelson, we've heard this controversy about the varying estimates of how much it would cost to go to the second stage—\$500 is the estimate of EPA; California Air Resources Board is at \$100. If you would, just tell us how you, from your perspective as representing the Manufacturers of Emission Controls, gauge the cost and the technical feasibility.

Then, if I might, maybe you could just then go into your opening statement.

Mr. BERTELSON. Okay. The technological challenges of meeting the tier two standard I think it is fair to say are there. We would agree with testimony given previously by other panelists that today there isn't a technology that you can point to and say that every car manufactured could meet those levels now.

But what we see is the progress that has been made and is continuing to be made not only in catalyst design, but also in improved engine control systems, increasing use of computers, electronic controls, fuel management, air management, our efforts to make more durable catalysts, improvements that we see coming in the quality of fuel, on-board diagnostics, which is going to help ensure the durability of emission control system—all of those things taken together suggest that achieving the levels proposed in S. 1630 by the year 2003 are within the realm of technological possibility.

With regard to the cost, because obviously at this point we don't have a particular system in mind, it is difficult to attach a cost figure to it. As a matter of fact, as a group that represents companies that manufacture only a part of the system, we have refrained from discussion what the total cost might be. But we were asked by EPA to provide some comments regarding their cost estimates on the tier two standard, and that was the letter that was referenced by Senator Baucus.

Basically, as you heard earlier, EPA gave a ball park estimate of \$500, and that involved two components: one, an electrically heated light-off catalyst to get very substantial reductions of HC and CO during cold temperature. And the second aspect was a catalyst replacement.

What we told EPA in a letter that we sent this week is that that's a strategy. But we don't believe, with 15 years of lead time, that that's going to be the preferred strategy. From our standpoint, what our company is going to be working on is a catalyst system that will be durable and will not require replacement at 50,000 miles. And I think, frankly, that will be the strategy that the entire industry will take.

The goal will be to have a system that doesn't involve replacement of the catalytic converter. So there is \$350 right there.

With regard to the electrically-heated light-off catalyst, that is a technology that is being developed right now. Some of the early results are very promising. It is a technology that may, indeed, be

used by some vehicles in the year 2003 if these standards are adopted.

But I can't say at this point, nor can industry say at this point, that every car will need one of those controls.

As Mr. Cackette suggested, there are lots of different strategies that will be looked at, and it is very likely that the one suggested by EPA—and, again, in fairness to them, they were trying to give a ball park figure looking at what could be done today to meet those standards. I think it is fair to say that the ultimate cost will be substantially less than what EPA suggested.

Senator LIEBERMAN. Thank you.

Why don't we formally begin your testimony now, and ask you to keep an eye on the lights and stick to the five minutes so that we can let everybody have their time. Thank you.

STATEMENT OF BRUCE I. BERTELSON, EXECUTIVE DIRECTOR, MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION

Mr. BERTELSON. I am Bruce Bertelson. I'm the Executive Director of the Manufacturers of Emission Controls Association. MECA is pleased to present testimony today to the subcommittee on ozone and CO nonattainment issues.

We commend the subcommittee for its efforts to address the serious air pollution problems currently confronting this nation. Legislation eventually passed by this Congress reauthorizing the Clean Air Act will establish the framework for the control programs that will determine the quality of the air we breathe well into the next century.

MECA is a nonprofit association of companies that manufacture various motor vehicle emission controls. Our membership includes companies with extensive experience and a proven track record in the development and application of catalytic converter and diesel particulate trap oxidizer technology.

The U.S. motor vehicle emission control program created in 1970, when Congress established technology-forcing standards which fostered the development of a new technology, is the most successful air quality control program in the world. Our companies are proud of the role we played in making that control program a success.

The pride in our past contributions, however, does not keep us from recognizing that the issue before this subcommittee is not which sources have or have not controlled emissions in the past, but what reductions can be achieved from all sources—stationary and mobile—to help address this nation's serious air quality problems.

In the time available, I'd like to briefly summarize some of the points that we cover in our written testimony.

First, we believe that with further refinement, optimization, and utilization of emission control technologies, either existing or under development, passenger car standards of 0.25 non-methane hydrocarbon, 3.4 CO, and .4 NO_x are technologically achievable for 100,000 miles. The technical solution will not simply be a better catalyst, but a complete system with improved catalyst designs and improved engine controls. We discuss that in a lot more detail in our testimony.

Second, the point that I made earlier: we believe that the possibility of achieving levels suggested for tier two in the year 2000 certainly is in the realm of technological possibility.

Third, proper vehicle maintenance is an important part in ensuring vehicles designed and built to meet emissions standards actually achieve those levels in use. Improvements in in-use compliance programs such as strengthened I&M programs, increased use of anti-tampering inspections, prohibitions against tampering and misfueling, all would help ensure that vehicles will be maintained, that emission control components are protected, and that in-use emissions are reduced.

Four, emission averaging to determine compliance with emission standards would constitute a major departure from the very core of the U.S. motor vehicle program, and we believe would pose a very serious threat to the effectiveness of that program.

We believe averaging, even with individual engine family emission limits, would allow greater emissions than those under a standard in which every car must meet the standard. In addition, averaging would discourage rather than encourage technological developments and make in-use enforcement extremely difficult.

Fifth, tremendous progress has been made in developing and applying diesel particulate control technology to trucks and buses. For example, one of our members recently announced that it intends to offer a diesel particulate trap system that will enable buses to meet the 1991 particulate standard. We are concerned that at the very moment the technological solutions to cleaning up diesel emissions are close at hand, EPA is contemplating a three-year delay in implementing the bus standard.

Finally, we recognize that tighter emission standards and other provisions in S. 1630 which will strengthen the motor vehicle program will create new engineering challenges for the motor vehicle industry, of which we are a part. But history has shown that the most effective way to ensure that needed technology development occurs is to establish fixed standards with provision for reasonable lead time.

Our members are prepared to do everything they can to help ensure that if more stringent standards are set, they will be met.

Thank you very much.

Senator BAUCUS. Thank you.

Next, Mr. Randall.

STATEMENT OF DONALD A. RANDALL, AUTOMOTIVE SERVICE ASSOCIATION

Mr. RANDALL. I'm Don Randall. Thank you.

I appreciate having the opportunity to be here today and to speak on behalf of the Auto Parts Accessory Association, the Automotive Warehouse Distributors Association, and the Specialty Equipment Manufacturers Association, and my own association, the Automotive Service Association.

We are a group of people who represent the small repair shops at the retail level, primarily, throughout the United States, and feel identified with the majority of those who are out there.

We are keenly aware that the Administration bill does not address the very serious competitive problems about which each member of this body has heard so much recently, and that is the extensive anti-competitive effect of the emission warranties.

We are here today to demonstrate our support for S. 1630. Except for the 11 words on page 103, lines 23 through 24, and lines 11 through 12 on page 104, and the fact that there seems to have been an omission of a requirement for a uniform diagnostic plug with uniform data or standard plug, we hope and urge the committee in the markup process to deal with those two issues.

Senator BAUCUS. To save you any further grief, Mr. Randall, you're right. That was an oversight. Those words will be omitted.

Mr. RANDALL. Thank you very much, Senator.

The bill, generally, reflects the agreement that we forged with the Chairman and Representative Henry Waxman shortly before the summer recess. By simplifying the complex emission warranty language in the current Clean Air Act, this agreement provides for better environmental protection, better consumer protection, and more open competition in the automotive aftermarket. This agreement gives a new vehicle owner a clear, workable, and understandable emission control warranty. It also protects the American consumer by allowing them to have their vehicle emission systems serviced and maintained at any place they choose. It also benefits the American public by providing for cleaner air without unduly harming competition.

In the past, our members have opposed the Federally mandated emission warranties because of their anti-competitive impact. The warranties put the independent repair shops and parts manufacturers at a competitive disadvantage with the auto dealers because vehicle owners are encouraged to return to the dealers by EPA and the State officials.

The automotive aftermarket—meaning sales after the original vehicle sale to the first vehicle purchaser—has traditionally been highly competitive. Aftermarket manufacturers are not only competitive in price, they are competitive in innovation and product quality, in level of service to their distributors, and to the final users—the repair shops.

New vehicle purchasers have traditionally sought service and repairs from new car dealers only during the two years, 24,000 miles of their voluntary competitive warranties. Even prior to when the warranty coverage has expired, vehicle owners have sought service and repairs outside the franchise car dealerships. In large part, this owner preference for service from the independent segment is due to price, quality of service, and convenience.

If Congress should retain this anti-competitive warranty at the present 5 year/50,000 miles, as would be done if the Administration bill prevails, it will have a devastating impact by further dislocating a significant part of the currently competitive service industry. This injury will become more pronounced as the I&M programs become more effective and widespread.

As a primary provider of parts and service to the U.S. car fleet, the independent network is an essential ingredient in the prescription for clean air that realistically calls for better vehicle care and maintenance. In other words, we are part of the solution.

If, inadvertently, Congress legislates us out of business by creating a new car dealer monopoly in the critical emission field, then the solution is in jeopardy.

While we agree with the worthy objectives of the Clean Air Act, we strongly object to the establishment of an unregulated monopoly in the service and repair of our vehicle emission control systems. This anti-competitive system generates sales opportunities for the dealers that would not otherwise be afforded to them in an open, competitive market place.

By operation of Federal law, the warranties deny our members equal protection of the laws. Competition, not a government-mandated monopoly, is the best discipline, because the current monopoly acts as a disincentive for product innovation, price competition, and quality service. Furthermore, vehicle inspection and pre-market approach will afford EPA, under the existing law and the law in S. 1630, sufficient data to enforce mandatory recalls where EPA finds a significant number of vehicles not to be in compliance with Federal emissions standards.

S. 1630 proposes to extend the time of the recall periods to 10 years or 100,000 miles. Consumers are confused with the current warranties. Dealers and independent repair shop owners are also confused. And the public is the most uncertain about what is covered under the current warranties.

Under this cloud of uncertainty, the consumer¹ preferred independent shop owner is often forced to send his customer to a new car dealer, and you can imagine how he feels when he finds out later after sending him there that the repairs performed were not under warranty at all but were competitively priced higher than his own repairs.

Senator Baucus, we commend you and the committee for seeking a means to promote competition in price and quality and service of the auto service market. We support S. 1630. We hope that the emissions systems will be warranted completely during the first 2 years/24,000 miles, and that competition, rather than a monopoly, will prevail following that period.

Thank you, sir.

Senator BAUCUS. Thanks, Mr. Randall, very much.

Next we will hear from Mr. Beckett.

STATEMENT OF DON BECKETT, OWNER, QUALITY MUFFLER AND BRAKE SHOP, VINELAND, NJ, REPRESENTING THE AUTOMOTIVE SERVICE INDUSTRY ASSOCIATION AND THE MOTOR AND EQUIPMENT MANUFACTURERS ASSOCIATION

Mr. BECKETT. Thank you, Mr. Chairman and members of the committee.

My name is Don Beckett. I own and operate Quality Muffler and Brake Shops in Vineland, New Jersey. I am very pleased to be here today to discuss a specific ozone and carbon monoxide attainment issue, namely, the useful life of mobile service warranty provisions of the Clean Air Act.

While I am testifying here today on behalf of two of the most important associations of our industry, Motor and Equipment Manufacturers Association and Automotive Service Industry Association,

I will, along with these two associations, be submitting a written statement to the committee. I am far from a professional lobbyist or lawyer. Certainly we have been interested for several years in the issues that we are discussing and have written regularly about them in Exhaust News. Some of the columns that I have written about on this issue in Exhaust News will appear as part of our written statement.

I make my living, however, selling automobile parts and service, and the catalytic converter and its associated parts are among the items we service on a regular basis.

I believe that my comments today would be endorsed by most people actually servicing cars. I start from the premise that there is now a widespread agreement that the warranties both design and performance on virtually all emission-related parts should be reduced to 2 years/24,000 miles. This recognizes that parts need to be maintained and replaced, and that such maintenance will do more to reduce vehicle emissions than warranties which, in fact, encourage car owners to ignore maintenance.

We also believe, of course, that Federally mandated warranties encourage car owners to return to their franchise dealers, thereby reducing needed competition in sale of parts and servicing of vehicles.

We are pleased that both bills which have been introduced recognize the fact that by reducing warranties on most parts and increasing the stringency of the State inspection and maintenance programs, disagreement in the warranty provisions have arisen primarily with respect to the length of the warranties for the catalytic converter and electronic control unit.

Congressman Waxman's H.R. 2323 and various members' of this committee S. 1630 have extended warranty coverage for those two components in addition to other emission warranty control components costing over \$200, beginning with the 1995 vehicles, 8 years and 80,000 miles, while President Bush's S. 1490 and Congressman Dingell's H.R. 2950 would maintain these warranties at 5 years/50,000 miles. We wholeheartedly agree with the latter approach.

Repair shops, in general, would be hurt because car owners will tend to return to their franchise dealers when warranty coverage is a possibility. But even more importantly, the longer warranties will not clean the air. As most people now recognize, the longer warranties will discourage maintenance, which is the key to cleaner air.

I have spoken to hundreds of customers who have told me that maintenance should not be necessary, since there is a 5 year/50,000 mile warranty. This situation can only be made worse with extended warranties. Why would we want to encourage this counter-productive tendency?

Unfortunately, I believe the same is true for the proposals to increase the useful life of the vehicle for recall and certification purposes to 10 years or 100,000 miles. We view the 10/100 recall and certification proposal as a *de facto* warranty.

When we add the negative impact of this to what we are already experiencing in the recent car makers' warranties, it has really had a devastating effect on our business. And this is a major reason I am appearing before this committee today.

I never dreamed I would see the day when Congress would be considering legislation that would put 400,000 small, independent automotive service center operators like myself out of business. It not only takes away the preferred choice of the customer, but, in all possibility, will only increase the pollution problem.

With respect to recalls, most cars are sold to the second owner after the 5 year/50,000 mile has been reached. Based on experience, it is unrealistic to expect the second or third owners to respond to recall notices if, in fact, they find out about them. As a result, the recall extensions make us feel good philosophically, but it is unlikely it will result in cleaner air.

The proposed increase in new vehicle certification is equally troublesome. It has not been possible to develop a 50,000 mile certification test which is representative of the in-use vehicles. And this is even more difficult with a 100,000 mile test. Instead, the likely result is the consumer mind set that maintenance is unnecessary. As we have already seen, this is a false belief and will continue to be so.

We should be encouraging owner maintenance, and not neglect.

The views which I have expressed here today are borne out of years of talking to car owners and servicing their vehicles.

As a matter of public policy, I believe we should be encouraging car maintenance, and this goal is best accomplished by the combined proposals of President Bush and Congressman Dingell.

I very much appreciate the opportunity to be here on behalf of the two major associations in the industry, and would be glad to answer any questions the committee may have.

Thank you.

Senator BAUCUS. Thank you very much.

Mr. Mandel.

STATEMENT OF JED R. MANDEL, GENERAL COUNSEL, ENGINE MANUFACTURERS ASSOCIATION

Mr. MANDEL. Thank you.

I am Jed Mandel, General Counsel of the Engine Manufacturers Association. My comments today relate to the concerns of heavy-duty diesel engine manufacturers regarding S. 1490 and S. 1630.

The current Clean Air Act provides a four-year lead time and three-year period of stability for heavy-duty diesel emission standards. S. 1490 would delete that requirement.

It is critically important to retain this lead time and period of stability. Heavy-duty diesel trucks typically are not the product of vertically integrated manufacturers. One company usually makes the engine, and another one assembles the truck.

This lead time and period of stability allows engine manufacturers to adequately plan for their diverse customers' needs. Moreover, unlike passenger cars, heavy-duty engine and vehicle product development and life cycles are longer, their volumes are smaller, and their time period for return on investment is longer.

S. 1490 does not mandate specific emission standards. It properly delegates to EPA the authority to set standards through the regulatory process where the requisite technical expertise is available. Any attempt to legislate specific statutory standards risks ignoring

technology feasibility and the tradeoff inherent in controlling certain related emissions. In fact, S. 1630 makes just such an error in mandating a heavy-duty diesel NO_x standard of 4 grams in 1994 and 2 grams in the year 2003.

A NO_x standard more stringent than 5 grams is currently not technologically feasible in conjunction with a one-tenth gram particulate standard. The responsibility for establishing the technological limits of the heavy-duty NO_x standard or for any other emission standard should rest with the EPA.

Both S. 1490 and S. 1630 would authorize EPA to shift its administrative and enforcement costs to manufacturers. Requiring such fees of manufacturers essentially authorizes EPA to proceed with programs without regard to their cost or benefits since none of the costs will fall upon EPA. In essence, EPA would be authorized to tax the public, who ultimately will bear those costs, without any Congressional oversight. EPA should not be allowed to impose such an unfair tax on those who are willing to buy the new, most advanced emission control technology.

In order to reduce the cost of compliance without adverse environmental impact, EPA has allowed heavy-duty engine manufacturers the flexibility of averaging emissions from engine families within the same class and category. S. 1630 would prohibit such regulatory flexibility programs. S. 1490 would encourage them.

EPA's authority to provide such programs should not be constrained. Averaging and similar regulatory flexibility programs can aid manufacturers in reducing the costs of controlling emissions. However, such programs can and must be structured appropriately to avoid adverse environmental and competitive impacts.

Moreover, such programs will encourage the development and earlier introduction of improved emission control technologies and alternate fueled vehicles.

Two other compliance-related issues have been raised. S. 1490 would authorize EPA to prescribe rebuild practices and promulgate emission standards for rebuilt engines. S. 1630 would mandate the use of data from State inspection and maintenance programs in determining whether an engine nonconformity should be recalled.

The heavy-duty engine industry does not oppose providing EPA with authority to study and potentially regulate rebuild practices and emissions; however, EPA must take into consideration such factors as cost, lead time, and technological feasibility. Moreover, EPA also should ensure that there be no adverse competitive impacts from rebuilt engine regulations.

Rather than regulating rebuilt engines, Congress and the EPA should consider whether inspection and maintenance programs might not be a more effective means of in-use emission control.

In considering the use of data from State inspection and maintenance programs, Congress should be mindful that the data from such programs cannot reveal whether failed engines were properly maintained, illegally tampered with, or within their useful life period. Thus, the provision in S. 1630 that would mandate the use of data from State I&M programs in determining whether there is an engine non-conformity would make manufacturers responsible for their customers' improper maintenance and illegal tampering. Congress should not impose such an unfair requirement.

Both bills would require the nationwide availability of low sulfur diesel fuel by October 1, 1993. EMA has been a long-time proponent of such a provision, and we strongly support the adoption of a low-sulfur fuel proposal as EPA has, itself, proposed in a rule making on August 24th, 1989.

Finally, S. 1490 would authorize the regulation of non-road engines, while S. 1630 would mandate such regulations. EMA is a member of and supports the comments of the Off-Highway Mobile Equipment Coalition, who you will be hearing from in a moment.

Mr. Chairman, thank you for the opportunity to discuss these important legislative issues with the subcommittee.

Senator BAUCUS. Thank you very much, Mr. Mandel.

Mr. Barker.

STATEMENT OF EMMETT BARKER, PRESIDENT, FARM AND INDUSTRIAL EQUIPMENT INSTITUTE

Mr. BARKER. Thank you, Mr. Chairman.

I'm Emmett Barker, president of the Farm and Industrial Equipment Institute. I'm here today to speak on behalf of the Off-Highway Mobile Equipment Coalition.

I would like to underscore the two most important points discussed in the written version of our testimony, which has been submitted for the record.

The first is that non-road engines merit separate consideration in the legislative and regulative process because they are different in type and function from other engines, particularly engines which are used to power on-road vehicles.

The second point is that the impact from non-road engines on human health and their impact on air quality have not been studied sufficiently to determine what level, if any, of regulation is appropriate.

Let me explain, if I might, the first point.

Engines used in non-road machines are not only different from on-road engines, but also are different from each other both in configuration and the uses to which they are put. These off-road engines range from 8 horsepower to 4,200 horsepower.

Considering just farm and industrial equipment, there are at least 33 separate families of equipment that are involved in this activity, each designed to perform a particular range of jobs. The engines that best perform many of these tasks operate at much lower specific outputs than truck engines. Emissions control technologies that were developed for high, specific-output on-road engines simply cannot be directly transferred to most non-road engines when there are such significant differences in design and operating characteristics.

In addition, non-road machines are produced in much lower volumes, so emission control costs have to be spread over production volumes numbering typically in the hundreds of units or fewer. The variety of engines and applications and the inability of individual technological fixes to cover all of them would further escalate these costs.

The second major point is that a thorough study of emissions from non-road engines is needed to ensure that any regulatory pro-

gram which may be adopted is based on solid information. For one thing, no way to accurately measure emissions from off-road equipment has yet been developed. Moreover, because of the widely-dispersed use of non-road engines, reduction of emissions from them may not lead to significant improvements in air quality. The high percentage of off-road equipment is located and used in rural areas.

In reality, no one knows the actual contribution of off-road diesel engines to ozone non-compliance or other air quality problems. There are no scientifically responsible, definite studies on the subject.

We believe that a comprehensive and reliable study of the non-road equipment industry's contribution to air quality problems is essential prior to Congress being able to advance any reasonable programs of regulation. If, upon reviewing the results of this study, the EPA administrator concludes that controls are warranted, he should have the authority to impose them—but only after taking the following factors into account: the expected improvement in air quality—what will it be?; the time required to develop safe and effective emissions control technologies, apply them to a wide range of dissimilar engines, re-tool, produce, and install the redesigned engines; the time required to develop test cycles that reasonably represent the wide variety of duty cycles found in non-road vehicles; and, of course, the cost of compliance to the industry and its customers.

These two major points I have outlined for you today lead, in our view, to several important conclusions for any proposed legislation.

At this time it is not appropriate or workable to require that off-road diesel engines meet the same emission standards and compliance time tables that are mandated for on-road diesel engines. Any legislation adopted should not, itself, prescribe the standards or time tables. Instead, the EPA administrator should be authorized to set emission standards for non-road engines after taking into account the special factors discussed earlier.

The EPA administrator should be given the freedom to provide for the lead times necessary to complete the engineering changes, and any authorizing legislation should contain the same preemptive language for off-road engine emission regulation as is provided in current law for on-road engines.

Thank you, Mr. Chairman.

Senator DURENBERGER. Thank you, Mr. Barker.

Gentlemen, we thank all of you, not only for your testimony and the effort that went into it, but for your patience in sitting through the first part of this hearing today. I think you can count on the committee's interest in your continued involvement individually in each of these issues.

I have a question I need to ask of Mr. Bertelson which deals with diesel trap technology and the bus standard.

I happen to have a constituent company in my State, the Donaldson Company, which has developed a trap which would assure that today's buses could meet the particulate standard of 0.1 grams in 1991. But apparently rumor has it that EPA is now considering a relaxation of that standard. So my question of you is why they might be doing that. Is there a need for the relaxation? Or should

we press ahead with some confidence that the technology is there to meet the need?

Mr. BERTELSON. Senator, you are absolutely correct in both points. One, Donaldson has indicated to the U.S. Environmental Protection Agency that they plan to have a system that would enable buses to meet the 1991 standard, and I think it is illustrative of the kind of progress that has been made—very dramatic progress particularly, recently in the area of trap control. They are now engaged in a series of demonstration programs all over the country from California to Minneapolis and New York to demonstrate and confirm that the technology they have will, indeed, achieve those levels. And they have made a substantial commitment in direction. They are only one of a number of companies that are working on the issue.

You are correct on the second point, and that is that there is the strong suggestion that EPA will propose a three-year relaxation. I think that comes from the fact that the Bush Administration, in their bill, proposed a three-year relaxation. So the assumption is that EPA will follow suit. I think that is very unfortunate, as I mentioned in our testimony. At the moment we seem to be at having a solution, EPA is considering a three-year delay. And I think it sends a very bad message to not only our industry—companies that have invested a substantial amount of money in reliance of the fact that if they come up with a product there will be a need for it. I think it also sends a bad message to the engine manufacturers who are working on this issue.

It will mean a lost opportunity to demonstrate the technology in the bus market with an eye toward extensive use of traps in 1994 with the truck. And I'm not an air quality expert, but it also means excess emissions from buses during those three years that really don't need to be.

So for all those reasons, we have some very serious concerns with the idea that EPA may delay the standards.

Senator DURENBERGER. I appreciate that response, and I think I'll communicate it, along with my own thoughts, to the Administrator. Because if, in fact, the only reason that it is there is because it is in the President's legislation, it seems to me they need a little better rationale.

The point, though, that you make about the investment and the technology is an important point, because everything else we seem to do around here, whether it is clean air or clean water, or whatever, is grounded on trying to move from some of these very difficult to achieve health-based standards to some standards that relate to technology. And we are trying to, in effect, bring the genius along with the investment requirements and the standards that we are trying to achieve, and to use that capability that we have in this country, which costs us money, to gradually move to reduce the problem is important to us. If we start doing it in fits and spurts and jerks and stops and that sort of thing, it seems to me we eliminate some part of the incentive out there for the competition. As you say, Donaldson isn't the only company. The competition out there is also healthy for us to advance the cause of the technology, as well.

Mr. BERTELSON. I can give you a first-hand example of exactly how the fits and starts impact on the industry.

In the early 1980s, EPA had proposed, indeed, the standards that are now taking effect in the 1990s and the mid 1980s. A number of our members became involved in developing diesel particulate controls in anticipation of those standards being implemented. The change of Administration resulted in those standards not being promulgated until they were forced to, under court order.

A number of companies who were involved in diesel particulate control efforts simply got out of it and have refused to get back into it because they've been burned. And I'm concerned that the same kind of thing is going to happen this time. We have different companies, and a number of companies—not only our members, a number of other people. And not only in this country, but all over the world—working on this issue. It sends, as I said, a very bad message when you start flip flopping on standards when it is not necessary to delay them.

I think most people would agree that a three-year delay of the bus standard, given where we are right now, is not justified technologically—not for technological reasons.

Senator DURENBERGER. I appreciate that response.

Gentlemen, we appreciate all of your testimony and your patience. We will thank you and recess the hearing.

[Whereupon, at 12:56 p.m., the subcommittee was recessed, to reconvene at 2:00 p.m. the same day.]

AFTERNOON SESSION—2:06 P.M.

Senator BAUCUS. The hearing will come to order.

Our first panel this afternoon includes: Mr. Ross Sandler, Commissioner of Transportation for the City of New York; Mr. Roger Dickenson, Chairman of the Board of Directors in Sacramento for the Regional Transit District; Ms. Regina McLaurin, President of the National Parking Association, who is accompanied by George Dragotta, who is Executive Vice President; and Mr. Ethan Geto, who is the Coordinator for the Coalition for Improved Transportation and Air Quality.

Mr. Sandler, please begin.

STATEMENT OF HON. ROSS SANDLER, COMMISSIONER OF TRANSPORTATION, CITY OF NEW YORK

Mr. SANDLER. Thank you very much.

I very much appreciate the opportunity to speak generally in support of S. 1630. What I'd like to do in the minutes allotted is to go through how a local government like New York City must approach achievement of clean air. Our goal, of course, is to achieve the Clean Air Act standards.

First, in terms of traffic, we are now at the range of 900,000 vehicles a day coming into Manhattan. The problem in a big area like New York City is the very significant increases in automobile traffic. These increases result in significant violations of the ambient air quality standards established by the Clean Air Act, which occur in various portions of New York City.

How is New York City or any urban area going to achieve the clean air quality standards? There are three major proposals: Cleaner vehicles; increasing speed—which means that the vehicles move through the area more quickly and, therefore, emit less exhaust; or fewer vehicles. These are our options for New York City and other urban areas.

First, alternative fuels are possible. We have not yet seen that we can use alternative fuels, although we put a very high stake in this. We think that this will be very important to us in the future.

Improvement in inspection and maintenance of the vehicles? Yes, although we have taken all the credit we can so far on inspection and maintenance, and we don't know that we can actually get additional benefits in terms of our plan at this point.

Tailpipe controls, new technology—very important, but we don't know what they are or what benefits can be achieved.

As for vehicle turnover, we have already received very many benefits in New York because of high vehicle turnover. Many of our vehicles, like taxis, turn over very quickly—two to three years.

So what do we need? In terms of quantifying our needs, we'll look at vehicles in motion in midtown as a surrogate for other tests of meeting the Clean Air Act standards. As a preliminary estimate, we need about a 20 percent reduction in our "vehicles in motion" in order to achieve the national standards. Looking at the list of ways to achieve cleaner vehicles, at this point in time we do not see any immediate benefits that will help us, although we are very hopeful about this area. I'd like to come back to it. This is a very important area to us, but we cannot now project benefits from cleaner vehicles.

Increasing speed would be the second method for us. What this means in New York City is computerization of traffic signals. We have over 9,000 signalized intersections in New York City. We have about one-third of them computerized already. We'll have the rest of them done in the next several years. What that will do for us is allow us to manage our traffic and our streets much more efficiently.

Better enforcement. We already have very stiff enforcement in New York City. Last year we towed over 100,000 scofflaws and illegally parked vehicles, and we collected over \$220 million in fines, which is probably a world record.

We could do more intersection work—that is to say, traffic agents in the intersection directing traffic in addition to traffic signals.

A third option, which is not really an option for New York City, is adding capacity. That would mean more bridges and tunnels to Manhattan. Obviously you can't widen Manhattan's avenues or streets.

So when you put together all the benefits we get out of increasing speeds and traffic management of our streets, we see we can perhaps get a 4 percent reduction toward our goal of a 20 percent reduction of vehicles in motion. So we'll take that credit and be able to achieve that.

That leaves us with the last alternative—fewer vehicles. Now, how can we achieve that goal? We see only three ways to do that:

First, make transit more attractive; second, voluntary shifts; third, restrictive measures.

With respect to making transit more attractive, New York City has, as the preeminent public transit city in the country with 83 percent of the people going to work in the morning already on public transportation, and an astounding 97 percent of those who go to work in the financial district on public transportation. It is really quite remarkable. No other city in the country—perhaps the world—has as high public transportation use going to work in the morning.

But, nevertheless, because of sheer numbers, there are still many hours a day when we could have more people using public transportation. And we have a \$17 billion, 10-year program to improve public transportation—new ferries, new buses, new transit networks, and other things that we're doing. But in New York City—and I think this is true across the country—whatever capacity you have for roads is used by vehicles. So whatever numbers of people you remove from vehicles by attracting them to transit, that space will be quickly used by other people and vehicles. There is tremendous latent demand for private automobile use. Virtually everybody has a car, everybody has a license, and the latent demand overwhelms whatever capacity you provide.

So with all that we're doing—and this is a tremendous program in terms of money and effort—we see only a 1 percent benefit for us from making transit more attractive in terms of fewer vehicles in motion.

So then the next option would be voluntary shifts. In some places communities have tried very hard to implement voluntary shifts. We've done that as well in New York. But the voluntary shifts involve a tremendous amount of organizing. And, again, your road capacity—if the capacity is there, the vehicles will be on the street, although we think attempts at voluntary shifts are worth doing, in any event. But can it achieve all that you want?

This is our total amount of traffic—vehicles in motion. We want a 20 percent drop. We cannot, at this point, calculate the benefits from hardware strategies. We think we've got a 4 percent drop in terms of speed improvement. We've got a 1 percent drop by shift to public transportation. That leaves 15 percent, or three-quarters of what we need. Could voluntary programs really achieve three-quarters of our need? We don't think so. And that is how we end up in the position of having to look at restrictive measures.

So what are the conclusions for an urban area? First, one conclusion is, I believe, that Congress must identify and require a solution sufficient to achieve Federal Clean Air Act goals. The nine parts per million standard for CO is the standard, and whatever legislation comes out should be sufficient to actually meet that goal.

Second, that traffic flow and transit improvements—and voluntary programs—will provide only a small part of that solution. And the difference must come from either new technology or restrictions. So technology becomes a reciprocal for restrictions. Whatever we don't get from new technology, we're going to have to get from restrictions. So in urban areas like ours, what is most important is having as tough a stand on technology-forcing provisions—on the

hardware strategy—on inspection and maintenance—on alternative fuels—forcing the vehicles to be as clean—as possible. Because if we don't get clean air there, we are inevitably pushed into restrictions. And local governments cannot and have not, in the 20 years of the Clean Air Act, been successful anywhere in imposing restrictions. No matter where you look, and no matter how many times they are restated in transportation control plans, they have simply not been done. And so this leads us to two thoughts.

Senator BAUCUS. I'll ask you to summarize.

Mr. SANDLER. Absolutely.

One is that U.S. Department of Transportation policy and the financing of highways and bridges, and so forth, should dovetail with whatever we have to do for transportation.

Third, if Congress is going to hold to the nine parts per million standard—which I think it should—then it should also embrace whatever is sufficient to achieve that, and that would have to include possible restrictions.

I compliment you on the bill and having listed the restrictions that have to be looked at, not that they are compelled, but if Congress does not stand with the local community, we will never be able to achieve those goals.

Senator BAUCUS. Thank you very much, Mr. Sandler.

Next we will hear from Mr. Roger Dickenson.

STATEMENT OF ROGER DICKENSON, CHAIRMAN, BOARD OF DIRECTORS, SACRAMENTO REGIONAL TRANSIT DISTRICT, SACRAMENTO, CA

Mr. DICKENSON. Thank you very much, Mr. Chairman.

At the outset, let me request your indulgence in that I have just come from the American Public Transit Association Annual Meeting in Atlanta and, therefore, have not had an opportunity to submit a prepared statement. I would ask the committee allow that to be done subsequent to the hearing, if that is agreeable.

Senator BAUCUS. No problem.

Mr. DICKENSON. Thank you.

I am the chairman of the Sacramento Regional Transit District, and also the chairman of the Policy Advisory Committee for what we call in Sacramento the Metro Study, which is a study that is nearing completion, looking at our transportation network needs for the next 20 years or so to the year 2010.

As background for my remarks, let me sketch some quick facts for you about the Sacramento region. Our 1985 population was about 1.25 million. We had about one million vehicles, and we had about 4.6 million vehicle trips daily with about 31 million vehicle miles travelled on a daily basis.

We are a nonattainment area in Sacramento for Federal clean air standards with, by State standards, up to 48 days a year in excess of the State ozone standard and carbon monoxide standards. Seventy percent of our oxides of nitrogen come from tailpipe emissions, and up to 80 percent of our carbon monoxide emissions come from tailpipe sources.

Now, regional transit operates a combined light rail and bus service carrying about 60,000 people daily in 26 light rail vehicles and about 185 buses.

Sketch that picture of today, if you will, against what the Air Resources Board in California has projected for our region in the year 2010—a population increasing by 46 percent to over 1.8 million people with 1.5 million vehicles, an increase of 47 percent; vehicle trips daily increasing to 6.85 million a day, up 48 percent; and an astounding 75 percent growth in vehicle miles travelled daily to 54.2 million.

Now, what has been the response in Sacramento to those kinds of projections? First of all, Sacramentans have shown, through recent polls, that air quality is at the top of the list of priorities to solve in our region. Second, last November Sacramento County voters passed a one-half cent sales tax, with a portion of that money dedicated to air quality planning, and one third of it dedicated to transit. Even the Sacramento Metropolitan Chamber of Commerce has declared air quality as its number one priority.

So we have, in Sacramento, a recognition that there is tremendous growth that is coming our way—in fact, has been coming our way—and that the consequent travel demand that creates poses a serious problem from an air quality attainment standpoint.

We recognize that to enjoy clean air we have to move more people in fewer vehicles, put simply. Yet, we find there are still two views—the debate over how to meet travel demand, which some contend ought to be satisfied by simply continuing to build roads, more parking, and associated infrastructure, as we have in the past; and those on the other side, who maintain that in order to preserve the quality of life that we enjoy in Sacramento, we have to ensure cleaner air as one component of that.

Unfortunately, we have often suffered from, politely said, insufficient or inadequate coordination between transportation planning and air quality planning. The Metro Study, which I mentioned earlier, is an example of that, in which we have talked about congestion relief as the prime component of that study so far, without having the air quality planning necessary to calculate what the air quality impacts are of simply building more roads.

What is the future for Sacramento? It is clear that our approaches in the past have not worked. In 1982, we adopted a plan in conformity with the Clean Air Act, and yet, a number of those measures have never been implemented effectively or have simply been shunted aside. It is clear that we can't build our way out of congestion.

Our wish list of projects in the Metro Study totalled \$2.3 billion over the next 20 years, and yet would only have a marginal affect on reducing congestion. It is clear that we have to put more people in fewer vehicles.

Now, local jurisdictions in our region, of course, often find themselves with competing goals. They want to encourage the location of commercial and industrial enterprises, which will build their tax base. But they may want the housing to go somewhere else. They may want to provide free parking as an incentive in suburban office parks, for example—something that competes directly with efforts to revitalize and build the central city.

We have, at the same time, people who say that we must move to ride sharing or other alternatives, and that we can only do that effectively with a voluntary approach. Yet, we require, in the City of Sacramento, for example, to have a parking space for every 400 square feet of office space—a parking space, incidentally, which may cost \$10,000 to \$20,000.

In the metro study we concluded that clean air is essential for our health and economic vitality in Sacramento, and that all future transportation projects and corridors must be evaluated and considered first and foremost for their development to encourage alternative modes of transportation.

What is the Federal role that we see with respect to clean air and transportation for our region?—which we think, incidentally, is not unique in terms of the growth cities of the West and the Southwest but, in fact, is an example of what we see across that region.

First of all, there must be clear, national policy that achievement of clean air standards is of the highest priority. That includes meeting those standards which will require integration and coordination of air quality and transportation planning through such things as—

Senator CHAFEE. You need to wind up, if you can.

Mr. DICKENSON. I'm just finishing. Thank you.

The Federal transportation decisions and investments must be guided by goals of optimizing mobility of people and goods and cleaning our air, rather than assessing simply the number of vehicles moved.

Federal transportation decisions and investments must give the highest priority—indeed, must require of local jurisdictions—increased high occupancy vehicles lanes, public transit, and the like. And local and State performance must be monitored to ensure progress toward and compliance with Federal clean air standards.

Finally, Federal tax policy should give preferred treatment—or at least equal treatment—to those who use public transit as it does to those who enjoy parking privileges.

In sum, I would say that for years the Federal Government has sent a mixed message calling for clean air, but virtually ignoring the emerging primary constituent transportation, which must be included if the call for cleaner air will be more than just an echo in the 21st century.

I applaud the committee for—

Senator CHAFEE. We've got to wind this up.

Mr. DICKENSON. Last sentence.

Senator CHAFEE. Last half sentence.

Mr. DICKENSON. Thank you.

I applaud the committee for its work and hope that you will proceed with this bill.

Thank you.

Senator CHAFEE. Good. We accept the plaudits.

Ms. McLaurin, I think we'd best go vote, and we'll be back very shortly.

[Recess.]

Senator BAUCUS. The committee will come back to order.

I understand Mr. Sandler and Mr. Dickenson have both completed their testimony. Is that correct?

Mr. DICKENSON. That's correct.

Senator BAUCUS. And I guess Ms. McLaurin will be next.

STATEMENT OF REGINA McLaurin, President, National Parking Association, Accompanied by George Dragotta, Executive Vice President, National Parking Association

Ms. McLaurin. Mr. Chairman and members of the subcommittee, my name is Regina McLaurin. I am vice president and chief financial officer of McLaurin Parking Company based in Raleigh, North Carolina, and a member of the city council in Kerry, North Carolina.

I am here today as president of the National Parking Association. With me is MPA's executive vice president, George Dragotta. We are the trade association for the commercial parking industry. Our members include over 175 companies who own or operate parking facilities across the country. We greatly appreciate the opportunity to present our views to you, and we focus on S. 1630, the subcommittee's proposed Clean Air Bill.

Mr. Chairman, most of our members serve the central business districts of our nation's cities. We are interested in the national policy promoting preservation and revitalization of our urban areas. Fortunately, that goal is entirely compatible with cleaning our air.

To revitalize our cities, we have to attract people into them—to live, to work, to shop, to dine, to be entertained. Congestion and pollution turn people off and keep them away. That's bad for our cities and bad for our business.

Let me make clear that we who operate parking facilities do not want unlimited cars coming into downtown areas. To the contrary, we want to see less congestion and pollution, thereby making our core urban areas more attractive places to live and work.

For these reasons, MPA strongly supports stricter emissions control, enhanced inspection and maintenance programs, and a rapid phase-in of clean fueled vehicles. We also strongly support transportation control measures that make it easy and attractive for people to get into the city.

MPA supports improved mass transit, HOV lanes, ride sharing, work schedule changes, employee ridership programs, and traffic flow improvements.

S. 1630 would, however, also require States to adopt measures which restrict or penalize automobile access to or within downtown areas. These measures include vehicle restricted zones, restriction of entire roads, some kind of trip reduction ordinances, road use charges, tolls, and parking surcharges.

MPA opposes these measures because they would ultimately keep people away from downtown areas, thus draining jobs and businesses out of our cities by doing nothing to cut auto emissions.

By their nature, access restrictions may not cut emissions or congestions, but merely relocate them. One study, for example, showed that if four free East River bridges in New York were closed to

single-driver cars, more cars would simply line up for longer periods at three other bridges and tunnels. It is apparent to us that that kind of restriction would only create new locations for congestion and pollution.

A study of auto restricted zones in Los Angeles predicted that net carbon monoxide emissions would gradually increase because of relocated congestion in the adjacent area.

Should we make restrictions even more severe? Should we really try to keep cars out of downtown? Not at all.

First, targeting the downtown traffic is becoming increasing irrelevant. Population, jobs, traffic, and congestion are moving to the suburbs. The typical commuter today isn't going downtown at all. The dominant commuting pattern is suburb to suburb, and that trend is growing fast.

In Raleigh, for example, traffic heads out of town toward the Research Triangle. Restricting downtown areas does not cope with the fastest-growing locations of vehicle travel growth.

Second, many people heading downtown simply cannot switch from private automobile use. They are people who don't live near mass transit, as in Raleigh; parents who have to shop or drive their children to day care on the way to work; the elderly; the handicapped; and many others.

If we impose punitive access charges or restrictions, these people will just join everybody else in looking for work in the suburbs, and that's a recipe for more pollution, not less. In the suburbs, more people own cars and are driving increasingly longer distance to get around. Pushing people and jobs into the suburbs will only create more vehicle traffic and new sources of congestion. At the same time, that will drain people, businesses, and jobs from the cities. The tax base will be further eroded, and the poor and the elderly increasingly abandoned in the inner city.

For these reasons, Mr. Chairman, we urge that measures restricting automobile access to downtown areas not being included in any list of transportation control measures. The Federal Government should not even encourage, much less mandate, State implementations by including them in the bill.

We also believe that language should be added—like that of the bill reported by the full committee in 1987—requiring States to ensure access to downtown areas and avoid implementation of measures which will only divert pollution elsewhere.

Thank you very much for your time and attention. Mr. Dragotta and I will be glad to answer any questions.

Senator BAUCUS. Thank you very much.

Mr. Geto.

STATEMENT OF ETHAN GETO, COORDINATOR, COALITION FOR IMPROVED TRANSPORTATION AND AIR QUALITY

Mr. GETO. Thank you.

Senator Baucus and members of the subcommittee, the Coalition for Improved Transportation & Air Quality, an alliance of labor unions, civic and community groups, health services providers, the tourism and entertainment industries, the retail and real estate industries, hotel and food industries, and other leading businesses in

the New York Metropolitan region, includes 5,000 businesses and a half million workers as members. I'd be glad to detail who those folks are if you want that kind of information.

While our alliance of business and labor heartily supports most provisions of S. 1630, we strongly object to language in the bill which would mandate or encourage pricing mechanisms or other like restrictions on vehicular access to central business districts. In our comprehensive written submission to the subcommittee, we cite studies that show how restrictions on automobile access to New York City central business district will devastate the entire region's economy.

Proposals such as congestion pricing, whereby motorists would be charged high fees to enter CBDs, would wreak havoc on the economy by discouraging shoppers, tourists, executives, middle management, and rank and file workers from consuming goods and services, working, and seeking entertainment in New York City or in other city centers across the nation.

What's more, no government entity, at the city, State, or Federal level, has conducted meaningful research as to the economic impact of pricing mechanisms. It is mind boggling to imagine that a policy, the success of which depends upon setting tolls and fees so high that millions of American motorists are to be forced out of their vehicles, is not informed by the most sophisticated econometric analysis available.

In New York, if automobile access were to be severely curtailed, a now delicately balanced and thriving city could wind up facing a devastating economic and social upheaval. Charging high tolls or fees also would unfairly discriminate against lower income residents of the outer boroughs of New York City and the suburbs of New York, New Jersey, and Connecticut, since it would restrict access to Manhattan based on ability to pay.

Is this what the Senate really wants to accomplish, making it so expensive to access city centers that only the affluent will be able to get in? Advocates of pricing mechanisms say that charging high tolls and fees will merely force many motorists out of their cars and onto mass transit. But study after study—and we've got them, many by the Federal DOT and Federal EPA—reveals that many Americans who drive to work do not have viable mass transit alternatives. Millions of Americans do not have convenient access to a bus line, let alone a commuter railroad or subway. For them, the ability to use their automobiles to get to where the jobs are, to reach hospitals, schools, and other vital services, is not a luxury—it is a basic necessity of life.

Furthermore, pricing mechanisms typically target the wrong group of vehicles—private automobiles driven for personal use. The peak congestion, as Commissioner Sandler from New York City will tell you, is in mid-day from 11:00 a.m. to 2:00 p.m., when commuter vehicles are parked. The vehicles which actually constitute the bulk of the air pollution problem in large urban centers such as New York are commercial vehicles—taxi cabs, limousines, private car services, and vans—which are constantly in motion and constitute the preponderance of vehicles on the streets during peak congestion hours.

The pricing mechanisms called for in S. 1630 would do nothing to address this, the real problem, while effectively shutting off access to CBDs for many workers and consumers.

Very briefly, I'd just like to tell you the strategies that we embrace and what some of the problems are that aren't being addressed.

New York State's principal pollution control strategy is the inspection and maintenance of automobile emission control equipment—the I&M program. But New York's I&M program is abysmal. According to EPA, it is, per capita, the worst in the nation. An EPA spot check showed that while 40 percent of the cars on the road in New York State are not meeting clean air standards—are spewing pollution out into the air—only 4 percent each year of these polluting cars in New York State are identified and repaired through the annual inspection process.

One last point I'd like to emphasize. Another vastly preferable means of encouraging motorists to switch to mass transit rather than imposing pricing mechanisms is the major expansion of parking facilities at commuter railroad stations. The New York Times did a major survey a couple of years ago, which we cite in our testimony, that found that tens of thousands of suburbanites in Westchester County along the Metro North Line, on Long Island along the Long Island Railroad, and so forth, prefer not to drive their cars into Manhattan, but are forced to because they cannot get a parking space at a commuter railroad station.

If the Federal Government were to provide greater assistance to capital programs that would do things like expand commuter parking facilities, we would achieve a reduction in the number of vehicles entering central business districts more substantial than any pricing mechanism could hope to do.

And, finally, we are very strongly in favor of alternative fuels. We think that the City of New York, which controls, owns, and operates 50,000 vehicles—that's just the city government of New York—and regulates tens of thousands of other vehicles, if those vehicles were mandated to be put on alternate fuels rapidly phased in, we could accomplish more than any pricing mechanisms would ever dream of accomplishing in cleaning up the air.

We appreciate your concern with citizens all across this country who use their cars to get to work and to shop and to access essential services, and we hope that the language in the bill—and we specify the provision in the bill that we think is the problem—is deleted.

Thank you.

Senator BAUCUS. Thank you very much, Mr. Geto.

Mr. Dickenson and Mr. Sandler, I would just like your response to the points, as I understand them, from Ms. McLaurin and Mr. Geto; namely, that provisions in the bill which exempt from the highway funds cutoff, the potential pricing restrictive measures, is not good policy and should not be in the bill. I wonder if either of you two could address that?

Mr. SANDLER. Yes. I'd like to speak to that.

As I read the bill, the bill does not compel any of the measures but does require EPA to advance studies of them and to evaluate them, and the communities to look at them at the time that they

are making judgments about their plan. I think that is appropriate. I think it would be inappropriate to do as Mr. Geto suggests, which is simply to eliminate even the consideration.

My reasoning on that is that from our experience in New York City, we have basically only two strategies—the hardware strategies, with which we are in complete agreement with Mr. Geto and others who have spoken to that, and if whatever we cannot achieve through lessening pollution from the cars by how Detroit builds them, then we will be forced to look at other strategies that include some sorts of restrictions.

It appears that some restrictions are more onerous than others. They all have social and economic consequences that need to be studied. They should be studied by EPA. They should be fully ventilated. The communities will surely have to do that, and that's what the bill does—and I think that's appropriate.

The other point I would like to make is that Congress, if it were to follow 1 suggestion made by Mr. Geto, to eliminate consideration of restrictive measures, would send places like New York City and Sacramento and all the cities of the country off on a fool's errand. I don't think it is possible, in my judgment, for urban areas to come into compliance if they have to change the behavior of motorists and they do it by local ordinance alone.

They need to have Congress say, in an absolutely clear fashion, that if that is what has to be done, then Congress and EPA will stand with you. If they are not there, then the local governments will be crushed in this effort, because they cannot, as local governments, take steps that are as difficult as this unless it is clear that it is national policy, that it is public health policy, and that the Federal Congress and the Federal public health agency, the EPA, agree that these are appropriate.

So I think that, in my judgment, you have to go forward with how you have written the bill, which is for full ventilation by EPA and full ventilation of the idea by the local governments, and then judgments can be made on appropriate circumstances.

Senator BAUCUS. So Mr. Sandler says that, as he reads the bill, it is discretionary. The pricing measures, etc., are just one on a list, and the local community is then to decide whether or not that makes sense. What is your response to that?

Mr. GETO. My response, Senator, is that it opens up a Pandora's Box. It is encouragement for local jurisdictions across this country to adopt pricing mechanisms and restrictions. They are, in one way, the easiest thing to do, because you can do that by administrative fiat, essentially. You can say that tomorrow morning we'll charge you \$20 to drive your car from Connecticut into Manhattan. I think that might break the back of—when people say pricing mechanisms will discourage people from accessing central business districts and will reduce the number of cars, they're right. But a lot of Senator Lieberman's constituents and a lot of constituents of many elected officials don't have mass transit alternatives. And it will break the back of people trying to get to work, and it will break the back of central cities who depend on suburban commuters, shoppers, tourists, and people accessing services.

So I think just by putting it in the bill the way it exists today, it is a signal and an encouragement that the Federal Government

will support this kind of activity, and we would hope that would not be included in the final draft.

Mr. DRAGOTTA. May I comment on that as well, please?

Senator BAUCUS. Sure.

Mr. DRAGOTTA. I think there is another element. As our testimony, I hope, makes clear, we are concerned with relocation. Pricing mechanisms and those sorts of transportation control measures will relocate emissions. If you have tolls—New York City, as an example. If you have ever increasing tolls on the bridges it will, as noted, force some people not to use those bridges. But what will happen? People will have to use adjacent roadways—people who were forced to use their cars because they have no alternative.

It has been said from time to time about our love affair with the car it is strictly comfort or convenience. And yet, I would question or would ask you to consider in the New York City area, where people line up in the morning at tunnels for half an hour or 45 minutes, pay a toll, pay a 14 percent parking surcharge currently in the City of New York, if that is simply a matter of comfort and convenience if they had viable alternatives.

There are classes of people that have no alternative. Eight percent have no fixed place of work—salesmen, repair technicians, and various people like that; multi-point trips, people who feel they are required to use their automobiles; single heads of household. Those folks who, over the last 20 years, have increased in numbers.

Senator BAUCUS. I see my time is expired. Let me ask another question, though.

In your testimony, Mr. Geto, I think it's on page 4, you say basically that vehicles that actually constitute the bulk of the air pollution problem in large, urban centers such as New York are vehicles for hire, as taxi cabs, limousines, private car services, and radio-dispatched "black cars." It sounds like that's not commuter traffic.

Mr. GETO. That's right. Exactly the point. Those vehicles—

Senator BAUCUS. Let me finish.

Mr. GETO. I'm sorry, Senator.

Senator BAUCUS. I'm just wondering. Maybe a city like New York, under this provision that you're talking about, would be addressing not commuter traffic, but adopting some other measures to try to restrict some of that local peak congestion which occurs basically from 11:00 a.m. to 2:00 p.m., as you state. This language certainly does not preclude that.

Mr. GETO. No, but I think that if the City of New York wanted to take those kinds of measures, they have now—and I could expand on that, because I'm pretty familiar with it—the immediate, current, local legislative authority or administrative jurisdiction to do that.

Unfortunately, Senator, with the City of New York, what the present city administration recently tried to do was to get medallions for an additional 1,800 taxi cabs and put more of those vehicles on the streets. The truth is that the language in this bill is not necessary for a local jurisdiction to restrict regulated vehicles, but it opens up, as I said, the Pandora's Box to discriminate against the less affluent who can't pay those higher tolls and fees.

Senator BAUCUS. I hear you. But I suspect, frankly, the local officials do want the provisions, because that's Federal backup for

something locally and they just can't do without some Federal backup.

My times has expired.

Mr. SANDLER. May I just comment?

Senator BAUCUS. Sure. Go ahead.

Mr. SANDLER. On the figure that you cited, Senator, we actually have two different kinds of problems in New York. We certainly have the mid-day problem, which was described. But the rush hour problem is equally severe, and that has as many problems for us in terms of air quality as the mid-day problem. And in New York City—and I suspect this will be true of other urban areas—we will have to be very sophisticated in our approaches, and we will have to target the various programs to meet the actual problem, as in New York, where the morning rush hour is a different kind of vehicle dominated by private cars, but the mid-day circulation problem in mid-town is dominated by commercial vehicles. So you do have two distinct problems, and they will require very distinct solutions.

Senator BAUCUS. Thank you.

Mr. DICKENSON. Senator, just very quickly endorsing the point you basically made, I think local officials clearly need that direction from the Federal level that all alternatives are on the table. Pricing mechanisms are not going to be entered into cavalierly. I can assure you that, having gone through parking price wars and toll wars, and so on. But to take those off the table at this point would be to send the wrong kind of signal.

Senator BAUCUS. Thank you.

Senator Lieberman.

Senator LIEBERMAN. Thank you, Mr. Chairman.

Mr. Geto, I look at the Coalition for Improved Transportation and Air Quality, and the constituent groups in it—retailers, restaurant and hotel people—and I'm puzzled by the position because I presume that they are motivated because they want people to have easy access into New York and out. But, if the air is filthy in New York City, they're not going to come in for that reason, either.

Second, most of the options that we provide really will not inhibit travel into a major metropolitan center. They may direct in different ways exactly how people get there. So I'm puzzled about this opposition, frankly.

Well, there are two points you made there, Senator, and I appreciate both of them.

On the first one, yes, the business and labor leadership for the New York metropolitan area, which is the backbone of this coalition, is very much interested in achieving clean air standards. And, as we testified while you were voting, we have supported and are vigorous supporters of a number of solutions—not only pie in the sky stuff that we say here today, but we've lobbied very hard in New York State and City, as well as down here on the Hill, for the solutions that we think are much more practical, much more achievable, and much quicker to achieve clean air.

One of the things I mentioned I think is something that you would appreciate. I cited a study done by the New York Times in 1987 which indicated the dearth of commuter parking spaces at commuter railroad stations, and that tens of thousands of people

along metro north and coming in from Connecticut and along the LIRR were forced to take their cars into Manhattan because of the lack of commuter parking facilities at suburban railroad stations.

There are a number of other points along those lines, but we think there are, through technology and through steps that local and State government could take, many other better ways to clean the air.

And the problem is that pricing mechanisms discriminate against the least affluent—the worker that has to drive his car to work may not be able to afford the \$10 to \$20 a day to pay the congestion pricing kind of tolls or fees. And the business community in New York and labor is saying that we depend on the free flow of traffic. What we would like to see happen is more mass transit use, but not through arbitrary imposed restrictions on automobile use, but on enhancements of mass transit access. We think that is possible and achievable.

So we'd like to see more mass transit and less vehicles. But to cut people off arbitrarily means that the great urban centers would face absolute economic chaos.

Senator LIEBERMAN. Well, the provisions in the bill on transportation controls really don't cut people off arbitrarily. They are really a series of options to be chosen by the communities.

Commissioner Sandler, do you agree that the list of options that Mr. Geto has proposed will take care of New York's problems?

Mr. SANDLER. I agree with you, first of all, it is a list of options. That's really the critical factor. I think that the view that Mr. Geto has stated here is really overreaction to what is actually in the bill. The bill is very sound in its approach. They want to kill it off before anybody even thinks about it, as opposed to going through a process which allows us to think about it coherently.

For New York City, very heavily dependent upon public transportation already, for us we have really—we'll have a net need of about 20 percent reduction in terms of vehicles in motion. For us, whatever we don't get from technology changes, we're going to have to get through some other fashion of restrictions. So we urge you to come down as hard as you can on the technology side, because what you don't get there, we're going to be forced, as local governments, to then have to face what, for many people—including Mr. Geto—are the unthinkable.

Senator LIEBERMAN. Absolutely. That's what we kept saying here. The automobile problem is the problem underneath the air pollution problem. And we keep making the cars cleaner and cleaner, but if people drive them more and buy more cars, then the air is still going to be dirty.

Mr. Geto mentioned more parking at commuter rail locations, and my understanding of our proposal is that that is just the kind of option that we mean to have funded under the transportation control measures in this bill.

I wonder if any of you—particularly Mr. Sandler or Mr. Dickenson—were interested in the broadest possible listing of transportation control options? Do you have any suggestions for additions to the list in section 103 of this bill?

Mr. SANDLER. Yes. We have one that I don't think was specifically listed, and that has to do with goods movement — deliveries and

goods movements—which has been a major problem. As you know, in mid-town, for instance, the curb space is occupied by very large trucks and vans for very much of the day. That's true in many other parts of the city. If goods movement were also on the list, I think that would be a useful addition.

Senator LIEBERMAN. Define that a little more. What do you mean by goods movement?

Mr. SANDLER. Well, the time of day of deliveries, consolidations. That would be helpful.

Senator LIEBERMAN. Thanks. My time is up.

Senator BAUCUS. Thank you, Senator.

Senator Chafee.

Senator CHAFEE. Thank you, Mr. Chairman.

Mr. Sandler, it seems to me you've got a very difficult problem. I looked at your charts as you were going through them, and one of your options was increased speeds. I think if you get increased speed and the traffic moves better, then there will be a greater incentive to bring one's car into town. You won't be caught in the gridlock that one currently is now.

I'd like to ask you and Mr. Geto a question. Currently, employers can provide, tax-free, to their employees a parking subsidy—\$15, \$20, or whatever. But there is a limit on how much they can contribute to the employee for a transit subsidy. Now, doesn't that seem foolish?

Mr. SANDLER. Yes.

Mr. GETO. Yes.

Mr. SANDLER. We agree completely. The law, as I understand it, is that the maximum allowable tax benefit deductible to the employer and not included to the employee is \$15.

Senator CHAFEE. For transit?

Mr. SANDLER. For transit. And for parking and car, so long as it is business related, in some fuzzy fashion it is unlimited. It could be a large amount of money.

There is some data on this that was collected by the Port Authority on people who commuted into Manhattan. Of the people that commute into Manhattan every day, about 64 percent are subsidized by their employer in some fashion. About 25 percent of them would change if the subsidy were in the other direction.

Senator CHAFEE. I strongly believe personally that charging—despite what Mr. Geto says—is important. The other day I went to one of our major hospitals in my city. Usually you can never find a parking space there. Now they've installed charging for the parking lots—modest. If you are an out-patient, you get a validation so you don't pay anything. There is plenty of space in the parking lot. I don't believe anybody suffered terribly by paying 40 cents an hour, or whatever it was, for the parking.

So you think if the parking subsidies were discouraged, you'd find greater use of high occupancy vehicles?

Mr. SANDLER. Yes. Absolutely.

Senator CHAFEE. Even though there wasn't a subsidy for that?

Mr. SANDLER. That's correct. But we would like it both ways. We would like to be pro transit and less towards car.

Senator CHAFEE. It seems to me in New York City, your problem is that you've got such a thin margin to expand on. I think you

said 97 percent of the people in the financial district come by public transit?

Mr. SANDLER. Yes. But New York City numbers are huge, generally. In Manhattan, below 60th Street, we have 3.5 million people a day that come in—huge tidal flows of people. So a percentage point is a lot for us.

Senator CHAFEE. Fine. Thank you.

Thank you, Mr. Chairman.

Senator BAUCUS. Ms. McLaurin, go ahead.

Ms. McLAURIN. I'd just like to make the comment—I hope that we will remember this. I realize New York City has a big problem, but aren't we looking at the entire United States? We feel like the restrictions at the borders will do nothing but relocate the congestion and the pollution.

Senator BAUCUS. Look at nonattainment areas throughout the country.

Ms. McLAURIN. Right.

Senator BAUCUS. There are other areas.

Ms. McLAURIN. But we've been discussing New York City.

Senator BAUCUS. New York has nonattainment. Yes.

Mr. DRAGOTTA. But doesn't it facilitate, as well, the limitations on the revitalization of cities? What we're concerned with, with the notion of entry fees or higher fees, if you relocate the emissions, that's a problem in the short term. In the long term, if it is more difficult to do business in terms of downtown areas and revitalization of downtown areas, it has been going on—and I think Mr. Dickenson suggested in his testimony, just to refer to Sacramento, with parking being available in the suburbs. What would happen if there are disincentives and businesses leave because it is harder to bring people in? That has happened in New York. It has happened here in Tysons Corner.

Senator BAUCUS. We have rehashed this point quite a bit here. But, again, it is discretionary, as it is in the bill, and it is up to local communities.

Senator CHAFEE. I do get your point. You're talking to the Environment Committee, as well as the Public Works Committee.

Mr. DRAGOTTA. Yes, sir.

Senator CHAFEE. And so we do face the problem that if we do something that discourages the use of the inner city, then you've got urban sprawl and the denigration of our environment.

Mr. DRAGOTTA. Suburb to suburb is now the dominant commuting pattern.

Mr. GETO. Senator Chafee, if I could—

Senator CHAFEE. We go up one alley, and we run into a problem.

Mr. GETO. I just want one sentence to make a comment.

Senator BAUCUS. One sentence.

Mr. GETO. The 40 cents parking fee a day may have worked there. Mr. Sandler proposed \$10 a day to come into Manhattan. That's a big difference.

Senator BAUCUS. Thank you very much. We appreciate it. Thank you for your testimony.

Our next panel will consist of: Mr. Thomas DeLoach, Vice President and General Manager of U.S. Marketing & Refining Division of Mobil Oil Company, representing the American Petroleum Insti-

tute; Mr. Charles Imbrecht, Chairman, California Energy Commission; Mr. William Gibeaut, Vice President, Market Development, for Columbia Gas, representing the American Gas Association and National Gas Vehicle Coalition; Mr. Thomas Cackette from the California Air Resources Board—welcome back; Mr. Wayne Kuhn, Vice President, Business Management, for ARCO Chemical Americas; and Mr. Eric Vaughn, President, Renewable Fuel Association.

Mr. DeLoach, please proceed. How do you pronounce that?

Mr. DeLoach. It's DeLoach—a hard O.

Senator BAUCUS. And hard CH?

Mr. DeLoach. Hard CH.

Senator BAUCUS. Thank you.

Mr. DeLoach. Are you ready?

Senator BAUCUS. You bet.

STATEMENT OF THOMAS C. DeLoach, VICE PRESIDENT AND GENERAL MANAGER, U.S. MARKETING AND REFINING DIVISION, MOBIL OIL CO., REPRESENTING THE AMERICAN PETROLEUM INSTITUTE

Mr. DeLoach. Good afternoon. My name is Tom DeLoach. I am vice president of marketing for Mobil's U.S. Marketing & Refining Division. I am pleased to appear here on behalf of the American Petroleum Institute to discuss oxygenated blends of gasoline and alternative fuels.

The petroleum industry is committed to the goals of the Clean Air Act. Although considerable progress has been made in reducing emissions for both fuels and vehicles, we recognize that more needs to be done to reach the air quality goals for carbon monoxide and ozone.

We believe design and implementation of oxygenated blend programs are best left to individual carbon monoxide nonattainment areas, as proposed in Senate 1490. The carbon monoxide nonattainment program is declining as a result of fleet turnover. Many areas with carbon monoxide problems already have oxygenate requirements in place.

S. 1630's mandate of a 3.1 percent oxygenate program, which precludes all oxygenates except ethanol for all carbon monoxide nonattainment areas, is not justified.

Alternative fuels are being considered to help solve the ozone problem. We would like to emphasize the importance of a complete analysis of all of the consequences of an alternative fuels program, including air quality effects, health and safety concerns, energy security issues, and economic impacts.

This analysis should consider fuels and vehicles together. Any alternative fuels program should include adequate time to evaluate promising fuel/vehicle combinations, precise criteria that do not favor one fuel, full participation of the Departments of Energy and Transportation, and equal treatment for all fuel suppliers. These principles are not reflected in the mandatory alternative fuels program of S. 1490. Although S. 1630 offers a preferable approach to S. 1490, neither bill provides enough time to accurately and fairly assess promising alternative fuels.

Because methanol and reformulated gasoline are the most likely candidates for widespread use, I'd like to focus on these fuels.

We are developing research to better identify the promise of combining reformulated gasoline with improved vehicle designs. These low emission systems will be compared to methanol vehicle emissions.

A report by Sierra Research concluded that current gasoline vehicles have better emission control performance than methanol vehicles. Reformulated gasoline has even greater potential as the fuel of the future. It has a particular advantage over alternative fuels because it could reduce emissions in existing automobiles.

One company recently began marketing a reformulated gasoline for use in older cars. Reformulated gasoline may require substantial investments in refineries, but it will allow us to fully utilize the existing fuel distribution system.

Methanol has some potential to reduce ozone since it replaces some hydrocarbon emissions with emissions of unburned methanol, which reacts less rapidly. However, low-mileage, well-maintained methanol vehicles produce three to five times more formaldehyde, and sometimes more nitrogen oxides, both of which are highly reactive in forming ozone, than conventional gasoline vehicles.

Because methanol is totally soluble in water, substantial and costly changes would have to be made in our fuel distribution system if it were chosen as the fuel of the future. Also, methanol is likely to be produced near low-cost supplies of foreign natural gas. There are clear national security implications to importing a finished product with insufficient domestic production capacity.

Finally, most analysts agree that methanol is likely to cost more than gasoline, raising consumer acceptance concerns. It makes sense to focus our efforts on reformulating gasoline first. Any fuel used in a flexible fuel vehicle will have to meet emission standards. If reformulated gasoline can meet the standard, any other fuel would be redundant.

Thank you for this opportunity to discuss these important issues. I'll be glad to answer questions as they come.

Senator BAUCUS. Thank you, Mr. DeLoach.

Mr. Imbrecht.

STATEMENT OF CHARLES IMBRECHT, CHAIRMAN, CALIFORNIA ENERGY COMMISSION

Mr. IMBRECHT. Thank you, Mr. Chairman and members. It is a great privilege for us to have been invited to participate in this hearing.

I have submitted extensive comments for your record and for your consideration, and I would like to just touch on a few of the points that have been raised in the earlier discussions, as well as to emphasize the results of a very comprehensive evaluation recently completed in California with respect to the viability of alternative fuels as an important and, I might add, essential component of any re-activation of the Federal clean air legislation under consideration by Congress.

Let me begin by noting that we have better than a decade-long experience in terms of a very thorough and, we believe, very

thoughtful evaluation of the broad range of alternative fuels which are available in the market place today. I want to stress that there is no singular best fuel, and there is no perfect solution. But in the context of a comparison with the status quo—namely, gasoline or diesel—there are a variety of alternative fuels that provide demonstrable and very significant air quality and energy security benefits.

As a consequence of our long evaluation and the largest test and demonstration fleets anywhere in the world with respect to alcohol vehicles, as well as the introduction of State funding for both electric vehicle and CNG demonstrations, as well, we believe we can offer an important base of experience in terms of Congress' consideration of the Federal air legislation.

In addition, as a consequence of State legislation passed about two years ago, the governor convened a comprehensive, multi-disciplinary advisory board on alternative fuels—a 17-member body composed of representatives of both the public and private sector, including three of the major petroleum companies—ARCO, Chevron, and Unocal—active in the California market, and representation from the major automobile companies and truck manufacturers, as well.

The board recently concluded its consideration of better than a year-long process to evaluate economics, health and safety, as well as energy security considerations. I'd like to just briefly quote from the findings of the board and note, as well, that my colleague, Mr. Cackette, from the Air Resources Board, will expand more fully on some of the issues that have been raised relative to toxicity and health and safety considerations that we, frankly, feel have been asked and answered and asked and answered repeatedly in California and are simply being regurgitated here on the East Coast in an effort to delay consideration and implementation of what is not only important, as I said, from an air quality standpoint, but also from an energy security standpoint.

First, with respect to health and safety, the board concluded that "the use of alternative fuels will provide improvements in air quality beyond what is achievable from conventionally fueled vehicles using the most advanced emission controls." And, I might add, this finding is also predicated on a substantial improvement in the existing quality of gasoline through the elimination of aromatics, much like reformulated gasolines that API has been advocating.

"Since it is likely that additional improvements in air quality will be needed, the use of alternative fuels will contribute to the goal of achieving air quality standards." That's the end of the quotation from the board's findings.

Secondly, with respect to economics, the majority of the board finds that methanol pump prices are likely to be 5 cents to 10 cents per gasoline-equivalent gallon higher than premium gasoline prices in low oil price scenarios. These extra costs would be justified by the air quality benefits obtained. A minority of the board finds that methanol prices are likely to be 30 to 40 cents per gallon equivalent higher than premium gasoline prices during low oil scenarios. At these prices, methanol is at the high end of reasonable cost for air quality strategies.

Let me just translate and summarize that finding for a bit. Unanimously the board, including the petroleum company representatives, concluded that at either high or low oil price scenarios for the future, methanol would be within the range of cost effective air quality strategies. I think that is a very important conclusion. This is a very lengthy document, and I urge it for the consideration of your staff.

Finally, with respect to energy security, the finding is methanol has the best potential for substantial market penetration into the general vehicle population. While there remains some debate regarding the security of potential supplies for imported methanol, the sources of methanol will be sufficiently diverse to limit the likelihood of supply restrictions.

I might note, in that context, we would double the number of countries that are potential transportation fuel exporters to the United States, greatly mitigating the prospect of any cartel-like interruptions in supply as occurred in the past.

Now, I have made my comments principally with respect to methanol because that was the tone and tenor of some of the earlier comments. But I want to stress that we find an equally important role, as I said, for both compressed natural gas and electric vehicles. I want to stress that, from our perspective, any Federal legislation involving a reinvigoration of the clean air legislation must have a very serious alternative fuels component. Reformulated gasoline is a very important and complementary step, and we applaud those petroleum companies that have engaged in the research and development effort in that regard. But we want to stress that it is complimentary, not exclusive, and, frankly, will not be enough to meet the Federal standards that affect so many of the major metropolitan areas in our country.

Thank you very much for your consideration.

Senator BAUCUS. Thank you, Mr. Imbrecht.

Next, Mr. Gibeaut.

**STATEMENT OF WILLIAM A. GIBEAUT, VICE PRESIDENT,
MARKET DEVELOPMENT, COLUMBIA GAS DISTRIBUTION CO.,
REPRESENTING THE AMERICAN GAS ASSOCIATION AND THE
NATURAL GAS VEHICLE COALITION**

Mr. GIBEAUT. Thank you.

I am William Gibeaut, vice president of Market Development for the Columbia Gas Distribution Companies. On behalf of the American Gas Association and the Natural Gas Vehicle Coalition, I'm here to affirm the contribution that natural gas vehicles—or NGVs, as we call them—can make to improve air quality.

We have three significant changes to propose to S. 1630 which would help increase the contributions that NGVs and other alternative fuels could make to reducing ozone and carbon monoxide pollution.

Because it reflects an important part of a strong Federal policy to promote cleaner air, we endorse with modification provisions of S. 1630 that would require EPA to set emission standards for alternative fuel vehicles—or, as they are called in the bill, low-polluting vehicles.

The modification that we recommend is that the higher carbon standard should regulate nonmethane hydrocarbons rather than total hydrocarbons. It is the nonmethane hydrocarbons—or VOCs, as they are also sometimes called—which cause ozone.

Consequently, the provisions in the bill that would require both a non-methane hydrocarbon standard and a total hydrocarbon standard is both counterproductive and inappropriate.

The lack of EPA emissions standards for natural gas vehicles appears to play a part in discouraging auto manufacturers from building NGVs since the manufacturer could waste a good deal of capital by designing and tooling for low-polluting natural gas vehicles, only to find that the vehicle cannot comply with standards promulgated after the investment is made.

Importantly, S. 1630 would eliminate this uncertainty with the change that we have recommended.

An ambitious program to promote the use of low-polluting alternative fuels is necessary for at least two reasons. First, tightened tailpipe standards on new gasoline and diesel vehicles cannot achieve all the desired improvements in air quality in the short term in many locations. Second, new vehicles displace old, dirty vehicles only over the course of many years. Thus, without an ambitious program to promote also the use of alternative fuel vehicles, significantly reduced vehicular air pollution can be achieved only after lengthy periods of time.

We are addressing mobile sources today, but the bill also would tighten emissions from stationary sources. However, the tighter stationary source provisions cannot offset current levels of vehicle emissions to improve air quality significantly in those most serious nonattainment areas. Vehicle emissions simply play too large a role in ozone and carbon monoxide pollution in many areas. An aggressive program to provide increased use of low-polluting, alternative fuel vehicles would help to offset stationary source emissions in the future.

Other legislative measures, such as S. 1490 in the Senate or H.R. 2823 or H.R. 99 in the House contain measures that would establish ambitious programs to promote low-polluting fuels. We recommend to this committee that a similar program be included in S. 1630 with provisions that would encourage vehicle conversions to low-polluting fuels, and also factory-built alternative fuel vehicles so that air pollution improvements could be attained quicker than otherwise would happen.

With respect to EPA's anti-tampering sanctions, we recommend that S. 1630 include an exemption from anti-tampering sanctions for vehicles converted to a low-polluting fuel. A vehicle conversion may technically violate the prohibitions against tampering, even though it provides the most immediately available technique for reducing tailpipe emissions.

This technical violation represents a substantial disincentive to convert vehicles. Because it conflicts with the principle that immediate improvements in air quality are desirable, we recommend that the provision be rectified to remove the disincentive to these conversions in the short term.

I would like to complete my oral statement today by assuring this subcommittee that the natural gas industry is already commit-

ting our own financial and management resources to natural gas vehicles. Like many other gas companies, Columbia Gas has converted a substantial number of its vehicles to natural gas, and will be aggressively increasing both the number of converted vehicles and refueling stations for our own company use, as well as offering to provide fuel stations for compressed natural gas to fleet operators.

We at Columbia take great pride in the contribution our latest project can make to cleaning urban air. Earlier this month we christened Columbia, the Nation's first bus designed and built to run exclusively on natural gas, which some of you may have seen first hand when it was here on the Hill last week, or you may have seen the article in the New York Times yesterday about it.

Because natural gas is so clean-burning, the bus has no particulate or sulfur emissions. You could put a white hankie to the tailpipe, and there is no soot emitted. The emissions of nitrogen oxide, carbon monoxide, and reactive hydrocarbons are substantially reduced compared to today's diesel buses.

We at Columbia are convinced that the use of natural gas buses can mean the end to buses that spew black soot in urban areas.

We are very encouraged by the strong interest by many Federal, State, and local officials, as well as the transit authorities in this particular CNG bus. Flexible, the manufacturer of our natural gas bus, is already getting orders for this newly-developed bus.

This completes my statement. Thank you.

Senator BAUCUS. Thank you.

Next, Mr. Cackette.

**STATEMENT OF THOMAS CACKETTE, DEPUTY EXECUTIVE
OFFICER, CALIFORNIA AIR RESOURCES BOARD**

Mr. CACKETTE. Thank you, Mr. Chairman.

Mr. Imbrecht earlier mentioned that we have had a decade of demonstration in California on alternative fuels. I'd like to mention that we have over 500 vehicles that are on the road and operating in fleet operation today. We have alternate fuel trucks. We have alternate fuel buses. We have alternate fuel tractors in the field. We have alternate fuel power plants.

We have measured the emissions from vehicles that have been fueled by methanol, ethanol, natural gas, propane, hydrogen, and electricity, and some of these vehicles have been driven over 100,000 miles in normal operation. So we have quite a basis for drawing judgments on the viability of alternate fuels.

Mr. Imbrecht also mentioned that a blue ribbon advisory board had recently made some conclusions and recommendations regarding alternate fuels, and he mentioned one which is of particular interest to the Air Resources Board, and that was the conclusion regarding the environmental benefits of clean fuels, which was that their use will provide improvements in air quality beyond what is achievable by the best foreseeable emission control technology on conventionally fueled vehicles.

And so I'd like to state that another way. What we read that conclusion to say is that any solution to at least Los Angeles' air quality problem is going to have to include both more stringent emis-

sion standards on conventional or petroleum fueled vehicles, and it is going to have to include a transition to cleaner fuels. Both of those are going to have to happen.

And this has recently been confirmed in the adoption of the State Implementation Plan for the Los Angeles area, which was approved locally and then also by the Air Resources Board earlier this year. That plan identifies the need to have 40 percent of all new light duty motor vehicle sales by the year 2000 be clean fueled vehicles.

And at the recommendation of this blue ribbon advisory board, the ARB staff is proceeding to develop the regulations necessary to achieve this goal, and the Air Resources Board, itself, will hold a hearing one year from now to consider adoption of these regulations.

During the evaluation of alternative fuels by this advisory board, there were a number of concerns that were raised regarding alternative fuels, and these concerns mainly were focused toward methanol. The focus of the concerns was that the use of methanol would be unwise and would create some new environmental problems.

In general, this advisory board found that there were answers to all these concerns, and in the remainder of my testimony I'd like to just touch on a few of them and share with you the response that ARB has developed to these concerns, which is based on some detailed studies and the testimony that was presented to the advisory board.

The first one has to do with the magnitude of air quality improvements. Mr. DeLoach mentioned earlier a Sierra Research report which concluded that methanol vehicles will have higher emissions than comparable gasoline vehicles, and this will lead towards negating any of the potential air quality benefits of alternate fuels.

Well, we had an auto industry member—in fact, he testified this morning—on the advisory board who refuted this claim.

Second, all of the evidence that was presented suggested that the exhaust of methanol vehicles is more chemically benign, thus creating less smog formation than gasoline exhaust. We have recently quantified this in a very detailed study performed by Carnegie-Mellon University in which it was demonstrated that methanol exhaust creates only about 20 percent as much smog as gasoline exhaust.

In summary, we think the evidence weighs heavily towards the conclusion that the use of methanol and the other clean fuels will improve air quality.

The second frequently mentioned concern deals with formaldehyde emissions. It is true that prototype methanol vehicles—the ones we have been testing today in California—emit more formaldehyde emissions than do gasoline cars. And, thus, it has been suggested that methanol use will increase the public's exposure to formaldehyde, a suspected carcinogen.

The same Carnegie-Mellon study that I mentioned earlier addressed this issue and found that ambient formaldehyde would not increase, even if formaldehyde emissions from methanol vehicles were higher. This occurs because most of the outdoor formaldehyde that we breathe is chemically formed in the air during smog forma-

tion. If you reduce the smog—which the use of methanol would do—you reduce the amount of formaldehyde that is in the atmosphere. And this reduction is enough to accommodate an increase in direct tailpipe emissions of formaldehyde.

But we didn't stop there with that answer. We have adopted standards that, as mentioned this morning, will result in methanol vehicles emitting no more or just slightly more formaldehyde than comparable gasoline vehicles.

It is also important to realize that the use of methanol and the other fuels will reduce the public's exposure to many of the cancer-causing substances that are emitted by gasoline-powered vehicles; benzene is one of them.

The final point was global warming. It has been argued that alternative fuel use would exacerbate global warming. This concern has particularly been focused on the use of methanol made from coal. Fortunately, methanol is not made from coal right now, and any expanded production of methanol in the foreseeable future is likely to be made from natural gas.

A recently published study of the global warming impact of the use of natural gas and of methanol made from natural gas concluded that the emissions from these vehicles and the entire production process would actually reduce greenhouse gases by a few percent to as much as 20 percent, so that while the use of alternate fuels may not be the solution to the global warming problem, it certainly is not going to make the problem worse.

That concludes my testimony.

Senator BAUCUS. Thank you very much.

Next, Mr. Kuhn.

STATEMENT OF WAYNE D. KUHN, VICE PRESIDENT, BUSINESS MANAGEMENT, ARCO CHEMICAL CO., ACCOMPANIED BY DUANE SMITH, SENIOR VICE PRESIDENT, MANUFACTURING, ARCO PRODUCTS CO.

Mr. KUHN. Thank you. My name is Wayne Kuhn, vice president of Business Management for ARCO Chemical Company. I am pleased to have the opportunity to address this committee on the role which oxygenates can play in improving air quality.

Also with me today is Mr. Duane Smith, senior vice president of manufacturing for ARCO Products Company.

ARCO Chemical Company is the world's largest producer of methyl tertiary butyl ether, MTBE, an oxygenate which has been widely used since 1973 as a gasoline blending component. We have nearly 20 years of experience in the production and use of oxygenates in automotive gasolines. We are currently working on methanol-based ETBE, which has environmental and performance advantages similar to MTBE.

Historically, MTBE's high octane value has been used by the refining industry to help replace lead in gasoline. More recently, however, the EPA, as well as many State air quality agencies, has chosen to make oxygenates a part of their quality improvement programs for another very important reason: their ability to improve the combustion efficiency of gasoline in motor vehicles, thereby reducing automotive exhaust emissions.

Extensive research has demonstrated that the addition of oxygenates to gasoline reduces emissions of carbon monoxide. Colorado was the first to take advantage of this by implementing a program to use two weight percent oxygen in gasoline sold in the Denver metropolitan area during the peak CO nonattainment months. The result was a significant reduction in automotive emissions.

Unfortunately, there are limits to what oxygenates can do. A recent report by the Congressional Research Service indicates that above the two weight percent level the emission reduction benefits diminish. Our own research supports this conclusion, which is true for both ethers and alcohols. This is one of the reasons we are opposed to the provision of S. 1630 which requires a minimum of 3.1 weight percent oxygen.

We feel that the decreasing environmental benefits at this high level do not justify the additional use of oxygenates and will not be cost effective. In addition, the 3.1 weight percent requirement will restrict or prohibit the use of MTBE or ETBE as the oxygen trading provision in the bill simply will not work. Instead of providing a level playing field, this provision will reduce market place competition to the detriment of the consuming public.

In amending the Clean Air Act, it is important to recognize that many CO nonattainment areas are also in violation of the ozone standard. MTBE, in addition to its CO emission reduction benefits, also has a proven ability to reduce ozone-forming hydrocarbon emissions.

Ethers are unique among oxygenated fuel compounds as their high octane, low volatility, and superior blending properties can be optimized within a refiner's operations. When used at two weight percent oxygen level, MTBE can result in a total hydrocarbon emission reduction of 10 to 13 percent; whereas gasohol provides little or not net hydrocarbon reduction benefit. The hydrocarbon reduction benefits of MTBE can be enhanced by other changes in the way gasoline is blended.

ARCO Products Company recently introduced a new blend of reformulated gasoline called EC-1. The EC stands for emission control. This new fuel has been formulated with a reduced vapor pressure and lower levels of sulfur, benzene, aromatic, and olefinic compounds. This new fuel, which is intended for use in older vehicles without catalyst controls, is also lead free. These changes, coupled with the addition of MTBE, are providing a fuel which, if used by everyone, would be equivalent to removing 20 percent of the older vehicles from the road.

In summary, we recommend that a national program be established for carbon monoxide and ozone air quality standards which recognizes their inter-relationship. This program should have the flexibility to allow states to take into account their particular situations. If a specific oxygen level is necessary, a 2 percent oxygen requirement would meet clean air needs, while allowing all oxygenated fuels to compete in the market place.

I would like to close by saying that we are proud to be able to come here to talk about the environmental benefits of MTBE and ARCO's EC-1. They can provide important benefits toward reducing emissions for millions of cars on the road today.

Thank you for your time and your considerate attention. Mr. Smith and I would be happy to answer any questions you may have.

Senator BAUCUS. Thank you, Mr. Kuhn.

Next, Mr. Eric Vaughn.

STATEMENT OF ERIC VAUGHN, PRESIDENT, RENEWABLE FUELS ASSOCIATION

Mr. VAUGHN. Senator, thank you very much. It is a pleasure to be here to discuss our industry's views and thoughts on S. 1630.

My name is Eric Vaughn. I am the president and chief executive officer of the Renewable Fuels Association, the national trade association for the domestic ethanol industry. I am here today on behalf of my membership to tell you that we are extremely supportive of the provisions contained in S. 1630 and want to praise you and the members of committee for the work that they have done, not only in the last several months, but over the last couple of years on legislation to reauthorize the Clean Air Act.

The Renewable Fuels Association is very pleased to have an opportunity to be here today and to set the record straight on several of the critical issues and several of the opportunities provided for alternative fuels in S. 1630, and we look forward to working with you and the subcommittee staff and the full committee staff in the months ahead as we work for passage of this important legislation.

Senator, as you know, the past several years we have testified before your committee and have discussed the role of ethanol-blended fuels in the market place. Ethanol blended fuels have grown dramatically to become one of the most important and significant oxygenated fuel blends available in the country today. Fully 8 percent of all the gasoline sold in the country today contains a 10 percent ethanol blend. And in the future, we hope, as Mr. Kuhn just stated, to see a new market place opportunity open for ethanol in the form of an ether, ETBE.

Ethanol and ETBE have a number of significant environmental benefits. They also have the ability to work as very effective octane alternatives for lead and as alternatives for toxic aromatic components and, as such, ethanol can be an extremely effective tool in reaching Federally mandated goals for carbon monoxide attainment. Ethanol can also play a significant role in a strategy for what is essentially becoming known as reformulated gasoline.

In the ethanol industry we applaud what ARCO is doing, and we wish them all the success in the future as they continue to make progress on reformulated gasoline. But, at the same time, we believe it is extremely important that the Congress specifically direct and establish standards for attaining specific maximum environmental benefits from reformulated gasoline.

The minimum environmental benefits should not be the goal of this committee, but the maximum achievable potential benefits from reformulated fuels and alternative, clean-burning fuels should be and is the goal of S. 1630.

Focusing on the substance of S. 1630, we plan to focus our comments today on two specific items that have come under some criti-

cism. One, in specific, is on the 3.1 percent oxygenated fuel standard for fuels marketed in carbon monoxide in alternative areas.

We believe that this program has been unfairly criticized as not essential or necessary to meet clean air goals. Oil companies have raised the linearity question which states that after 2 percent oxygen the benefits from oxygenated fuels fall off dramatically.

We believe the arguments or criticisms against oxygenated fuels are specious, at best. The fact is that EPA, as late as Monday of this week, has issued another report stating with complete clarity, that the issue of oxygen content linearity is extremely solid, that within 95 percent accuracy the direct relationship exists between the oxygen content and carbon monoxide reduction benefits is easily and very effectively tracked.

The oxygen content trading credits program included in your legislation, if modeled after a credits program designed to reduce lead content in gasoline in the early part of this decade, can be very effectively and very efficiently implemented to assure a wide range of alternative fuels in the market.

And, with regard to an ethanol mandate, Mr. Baucus, as you know, last year your legislation called for a 3.7 percent oxygen content program. You have scaled that back. You have already compromised to a 3.1 program. The fact is: the 3.1 percent program, with the oxygen trading credit program in place, will provide extremely effective flexibility in allowing all oxygenated fuels to compete in that market place. It is not going to be an ethanol mandate, but it is going to be a very effective program at reaching a very effective set of clean air goals and objectives.

When we discuss reformulated gasoline and fuel quality we think that ethanol and possibly ETBE, as it becomes commercially available, have a role in that new fuel. As you review the history of the activities of this committee, alone, you and this committee discussed reformulated gasoline almost two years ago. There was an effort underway Senator, in this committee, with you and Mr. Durenberger to attempt to reduce the aromatic fraction of gasoline—to take down the benzene content, to reduce the xylene content.

At this point in time, while we can applaud what ARCO has done to date and look forward to what the other oil companies can do, I believe we need to set standards—tough, rigorous standards—that will achieve the maximum potential clean air benefit. For example, eliminating the xylene content of gasoline, the single worst actor in gasoline from an ozone standpoint.

We'd like to work with you, and we look forward to working with your staff in the weeks and months ahead to achieve a common objective, which is clean air.

Thank you very much for allowing us the opportunity to be here today.

Senator BAUCUS. Thank you, Mr. Vaughn.

Gentlemen, I think I can speak for Senator Chafee and almost everybody on the committee in saying that we agree that alternative fuels are part of the solution. Reformulated gasoline is probably part of the solution, and alternative fuels are part of the solution, in addition to tighter emissions standards, too, if we're going to seriously reduce urban smog in this country.

We decided we didn't want to mandate a certain alternative fuel. We did not want to mandate, as the Administration's bill, a certain number of methanol autos to be fired because that would be, at least in my view, a bit of a heavy-handed intrusion into the market place.

I believe that competition basically does work, and the more that the oil and gas companies and the alternative fuel companies compete among themselves to try to come up with a fuel in conjunction with the auto companies, that might probably more likely come up with a more efficient solution.

Some can argue that under that scenario nothing is going to happen, and that you need additional impetus and incentive, if you will, to the clean fuel/alternative fuel producers.

I wonder if you can help me out a little bit in trying to resolve that dilemma. In the bill we did not mandate, as you know, methanol vehicles or a certain number of methanol vehicles or methanol use, as is contained in the Administration's bill. Would you like to take a crack at that?

Mr. GIBEAUT. I agree it is a dilemma, Senator. I don't have a specific recommendation, but there are some options to provide incentives. One already exists in legislation passed by the last Congress, which is to give the manufacturers some CAFE credits for putting clean alternative fuel vehicles into the market place. That allows them, if they make alternative fuel vehicles to get extra credit in their CAFE program. So that would give the manufacturers an incentive.

Frequently in a public policy issue tax credits to the people who are going to participate in the program are used—either the fleet operators or the installers of alternative fuel stations—for a period of years, and then they would be phased out.

Senator BAUCUS. What about the basic provision of the bill? Does anybody have a strong view as to whether it either will or will not work—where we are neutral with respect to alternative fuels—let the auto industry, in conjunction with the fuel producers, whether they are oil and gas or alternative, so-called clean fuels, work it out?

Mr. DELOACH. The one part that you have added to the bill is the ethanol piece that is 3.1 percent. Yes, there are credits that you can trade; however, that means that someone has to use ethanol to generate the credit.

I don't believe that without a tax credit that is currently applied to ethanol that you would see very much of it in utilization in this country, because ethanol is quite expensive to manufacture.

You are looking at a market that is over 100 billion gallons a year of gasoline. That is a huge amount of fuel that has to be manufactured. You are absolutely right in trying to make the standards the same for everyone to compete in that market place. To tilt the balance towards any one fuel would be a mistake, and I think you are trying to address that.

The ethanol piece is the only one that is now trying to say mandate a certain amount. Even with credits, someone has to use it to get that credit. So that piece is in there.

Mr. IMBRECHT. I would just say very quickly that I think the key to that question of whether the provisions in your bill will work is

really a function of where you set the standards. It seems to me quite clear that the first thing you ought to stipulate if you are going to use your approach is that the standards should be equivalent at least to the emissions improvement associated and documented with respect to methanol. That's even better for CNG, etc. But that, in fact, will help drive the technology.

If you set too high a standard, then, in fact, you're only going to get reformulated gasoline in the market place.

In that context, the other issue that it seems to me you need ask yourselves is: what, in fact, is the time frame in which you wish to see major urban areas brought into attainment. I think that one of the issues in the President's decision was clearly trying to put more than just rhetoric behind a commitment that the major urban areas would, in fact, be within attainment in a 20-year window. And that is why jump starting with mandates I think was viewed as advisable.

Senator BAUCUS. Does EPA have different waivers for MTBE and ETBE? Perhaps there is a tilt there that should be addressed.

Mr. KUHN. They have a different waiver. MTBE has a waiver; ETBE currently does not have a waiver.

Senator BAUCUS. Should ETBE also have a waiver?

Mr. KUHN. There is no reason it shouldn't have a waiver. There is not enough of it currently being produced that the data has been collected to submit to the EPA to apply for a waiver.

Mr. VAUGHN. Senator, the domestic ethanol industry believes that when the time is appropriate, there are certain things that need to take place. There is an effort underway to seek a clarification of the tax code to provide ETBE with the alcohol blended tax credit benefits. Once that is resolved, the sense would be to move ahead with an application for what would be described as a substantially similar waiver request to achieve blend levels similar to those available to MTBE.

Senator BAUCUS. There is a credit now available for ETBE; is that correct?

Mr. VAUGHN. It is not quite clear as to whether or not the credit, in fact, would apply to the ethanol portion of an ether blend. That's something that's the subject of a—

Senator BAUCUS. But you'd like to be clear that it does apply.

Mr. VAUGHN. We most certainly would. Yes.

Senator BAUCUS. And then the industry will apply to EPA for a waiver; is that correct?

Mr. VAUGHN. That's correct.

Senator, regarding your previous question with regard to a mandate, if half the country today is living in cities considered in non-attainment, and if ethanol blended fuels can reduce carbon monoxide according to EPA by 25 to 30 percent with just the 10 percent addition of ethanol, and if you assume that ethanol, under this legislation, would—I'll be grandiose and suggest that we might get a 50 percent market share in half the population of the country—for six months of the year you're talking about roughly 1.5 billion gallons of ethanol, or roughly a 50 percent increase in the capacity of the ethanol industry. We're not talking about a massive growth plan for the domestic ethanol industry. And that assumes every city in the country puts in place a 50 percent market penetration

blend program. That's highly optimistic, from our perspective. We think your 3.1 oxygenated fuels program can work very effectively, and will certainly provide a boost to the ethanol industry. But the lion's share of the oxygenated fuels program would clearly favor the MTBE, at this point.

Senator BAUCUS. Thank you very much.

Senator Chafee.

Senator CHAFEE. Thank you, Mr. Chairman.

Mr. Cackette, how is the Air Resources Board going to go about setting the standards that are going to result in 40 percent of the sale of automobiles in southern California to be alternative fuel?

Mr. CACKETTE. First of all—

Senator CHAFEE. You have a lot of lead time. When is that? By 2000?

Mr. CACKETTE. Yes. That's the goal—40 percent of the new vehicles sold in the year 2000.

The approach that we're using is a fuel neutral approach, and it relies on the establishment of performance standards for both the vehicles and for the fuels. And the way that it would work is, in essence, we would be setting an emissions standard—a very, very stringent emissions standard similar to the .125, or even more stringent—for a certain fraction of the cars sold beginning in the late 1990s. And that percentage would escalate up so manufacturers selling cars in California might start off with 80 percent of the vehicles meeting the normal emissions standard. They would have to also sell another 20 percent that meet a more stringent emissions standard. And that standard can be met in a number of ways. It could be met by reducing the amounts of emissions from a gasoline-powered vehicle, or it could be met by changing the chemical composition of the exhaust. The easiest way of doing that is using an alternate fuel.

Either way, a vehicle that met that low emission standard would be producing a lot less smog than the current vehicles sold at that time. And we would just phase that up until whatever objectives are made.

On the fuel side, we do something similar. People that sell gasoline today would be required to sell appropriate alternative fuels to power the vehicles that are being produced by the manufacturers.

Senator CHAFEE. Finally, how are you going to get somebody to buy the car?

Mr. CACKETTE. The way that it would work is just like any emission standard. Manufacturers have to meet the emission standard. And so they will be in charge of marketing, as they appropriately should, those vehicles. The vehicles will be, in our view, flexible fuel vehicles, whether they are powered by propane, methanol, or natural gas, they would be able to run on gasoline. And on the fuel side, it will be up to the fuel marketers to market the fuel that these vehicles need, and they'll have to do a good marketing job and price it appropriately so that the consumer will want to buy the fuels—and I think they will want to buy these fuels because they are all a better fuel in terms of performance, as well as environmental impacts, than current gasoline.

Senator CHAFEE. Mr. DeLoach, have you had much trouble getting your stations to go to Stage II where they are required to, like in California?

Mr. DeLoach. Have we had much trouble?

Senator CHAFEE. You had to, but what—

Mr. DeLoach. It is cost. You have to spend \$25,000 to \$30,000 per station to install Stage II on a retrofit basis.

Senator CHAFEE. How do you pick that up? Most of your stations—

Mr. DeLoach. Most of our stations are company owned, so it costs us money to install the Stage II equipment.

Senator CHAFEE. How about the stations that aren't company owned where you have a franchise?

Mr. DeLoach. Even the franchised lessee dealer is in a station that is owned by the oil company. There are independent dealers that own their own property and their own station, and those people are independent business people that put in the facilities for Stage II.

Senator CHAFEE. Has there been much kicking? How do they make it up? Do they increase the price of their gasoline?

Mr. DeLoach. No one is excited about installing Stage II. Not many people enjoy trying to shove their nozzles down so that you get a tight fit and actually recover the vapors. The law is that you have Stage II, so Stage II is installed.

Senator CHAFEE. One suggestion was critical of Stage II from one of the witnesses—I think it was yesterday—that said that they have to hold the hose in there for 15 seconds after you have continued dispersing the gasoline. Is that true or not?

Mr. DeLoach. After you complete—yes, that is. Otherwise, you will break the connection. When you stop, you need to let it displace. It is a balanced system that, as you push gasoline into the tank, that gasoline, itself, forces a vapor back through the coaxial cable back into the underground storage.

Senator CHAFEE. And so once you finish loading the car, you have to wait so many seconds?

Mr. DeLoach. Fifteen seconds is kind of a nominal type time period. If you break the connection at all, the pump shuts off because it thinks you are through, and you have to wait. So you are finished. It depends on the design of the equipment that will make that go back and forth. The on-board canister that you have included in the bill is an alternative to that Stage II.

Senator CHAFEE. We have spent a lot of time on that. [Laughter.]

Mr. DeLoach. I had to say that. You would have thought I was sick if I hadn't.

Senator CHAFEE. Let's not go through that any more.

Mr. CACKETTE. Senator Chafee, I just wanted to introduce myself as one person who does not dislike refueling cars with Stage II vapor recovery. I have been doing it ever since I have lived in California. We have had this system since the mid-1970s. It is easy to use. You don't have to wait 15 seconds. They don't disconnect immediately. But by the time you pull that thing away, it has already done its job.

The thing that I find most attractive about it is that you don't have to smell gasoline. After a while when you sit there and refuel

your car and there is no smell, and you go to a station that doesn't have a nozzle, you notice it right away. Of course, as you become more educated in environmental things you realize that part of the vapors that are coming off of the refueling have benzene in them, which is a known carcinogen, and that makes you feel a little bit better about Stage II.

Senator CHAFEE. I'm for the system. But for you to testify saying you're also for it, you'd be highly suspect if you weren't for it.

Mr. CACKETTE. I was testifying as me, though, not as—

Senator CHAFEE. You're hardly a totally unbiased contributor.

Mr. IMBRECHT. My agency did not impose this requirement, and I can only say that I have used them for the last 14 or 15 years, as well. The technology has improved dramatically. Some of the problems that you have heard expressed again here in Washington are a reflection of how the pumps performed 15 years ago.

Today there is an automatic shut-off system that, in essence, signals to you when to remove the nozzle from the car. I, frankly, don't notice any time constraint whatsoever that would suggest—

Senator CHAFEE. What does Mr. DeLoach say about that? Is that another \$20,000 per—what did you say it cost per pump?

Mr. DeLOACH. Depending on the size of the service station, you're looking at \$25,000 to \$30,000. In New York City—

Senator CHAFEE. Per station?

Mr. DeLOACH. Per station. And we recently did that in New York, and that pushed it as much as \$50,000 per station.

Senator CHAFEE. This up-to-date equipment that Mr. Imbrecht is talking about—

Mr. DeLOACH. He's absolutely right. We are installing better equipment today. It is more advanced.

Senator CHAFEE. Is that just the dispensing part, or is that the total equipment?

Mr. DeLOACH. What he is referring to is the bellows, itself. At one time there was such a stiff bellows and it was so heavy that not many people could handle it very easily. So it has improved over time.

Mr. IMBRECHT. And the flexibility of the hose has also improved greatly.

Senator CHAFEE. The market place has worked?

Mr. IMBRECHT. Yes.

Senator CHAFEE. Senator Warner.

Senator WARNER. Just one question—and it may bear on national security—and that's the implications of the natural gas. Would that have any negative impact? The large amount that will be required to be used to get methanol?

Mr. DeLOACH. To meet—

Senator WARNER. To have the methane.

Mr. DeLOACH. To have the methane—it's really not the methane that I think you're addressing; it is to make the methanol.

Senator WARNER. That's right. Methanol.

Mr. DeLOACH. If we were using 100 billion gallons a year of gasoline, to get the same number of miles you would have to essentially import 200 billion gallons of methanol into the country. That seems a little on the ridiculous side. It would be a tremendous import level.

Mr. IMBRECHT. With all due respect, that's a ridiculous set of assumptions to bring into your answer. The fact of the matter is that nobody contemplates a total displacement of gasoline in the national market place, and I have not heard anyone in the debate suggest that.

Senator WARNER. Let the gentleman finish his answer, if you don't mind.

Mr. DELOACH. Thank you. That is an interesting comment from Mr. Imbrecht. The one part that—as you move more and more towards methanol, that means a higher level of imports of this material would have to come in.

Now, I have heard suggested that a flexible fuel vehicle is the answer because you're not going to have 100 percent change out, as he just indicated. That means that you're going to have to have an automobile that can burn methanol and meet a tight emissions specification. I assume that the same automobile would have to meet a tight emissions specification when it is burning the gasoline. If it can be designed to burn a reformulated gasoline to meet the tight emissions specification, then why does it need to burn methanol in the first place? That seems to me to be a conflict in basic logic.

Mr. IMBRECHT. Senator Warner, I apologize for interrupting.

Senator WARNER. If you think that deserves an apology, you should have been on the floor of the Senate in the last two hours.

Mr. IMBRECHT. The point I was trying to make, Senator, is that, frankly, nobody is suggesting that methanol or any of the alternate fuels should be required throughout the entire United States. There are, in fact, many areas that simply do not face the same level of air quality problems, nor, and more importantly, does anyone contemplate an elimination of gasoline as the predominant transportation fuel in the United States any time in the foreseeable future.

What we're talking about is diversifying the transportation fuel mix to provide energy security against dislocation interruption from any given fuel source, to essentially double the number of resources and countries from which we can draw transportation fuel, greatly mitigating against the prospect of another OPEC because we're expanding the ethnicity and geography and so forth of our supply basins; and, at the same time, improving air quality.

In respect to the issue about what happens on a flexible fuel vehicle, the fact of the matter is that yes, on gasoline it will meet those standards that are set, but on methanol it will perform that much better and reduce emissions that much further.

We think reformulated gasoline and MTBE and ETBE that are predicated upon methanol and ethanol feed stocks speaks for itself. Even the industry is moving in the direction of using these additives to improve the quality of gasoline.

We think, after extensive testing, that it is abundantly clear—and I have heard no one from the industry suggest that they are confident that they can meet the emissions levels associated with alcohol fuels, much less CNG or electric vehicles with any kind of reformulated gasoline. They can improve their emissions greatly. We applaud that. It is complementary with what we are trying to

do, as well, and all of it should be part of an integrated national Clean Air Act.

Senator WARNER. Thank you.

Senator CHAFEE. Senator Warner appears, and things liven up around here.

Well, thank you all very much, gentlemen, for your testimony.

That completes the hearing for today.

[Whereupon, at 3:56 p.m., the hearing was adjourned.]

[Statements submitted for the record and responses to additional questions follow:]

COMMENTS OF SENATOR CARL LEVIN ON MOBILE SOURCE
EMISSIONS AND CLEAN AIR LEGISLATION

First, I would like to thank the Chairman, Senator Baucus, and the Ranking Republican Member, Senator Chafee, for inviting me to testify before the Subcommittee on Environmental Protection.

Mr. Chairman, we all want Clean Air, and we all want to reauthorize the Clean Air Act. I am a cosponsor of the Administration's bill, S. 1490, to reauthorize the Clean Air Act, a bill which includes provisions to reduce the emissions from cars that contribute to the formation of ozone. It is some of these provisions that I will comment on today.

While my testimony today will focus on hydrocarbon emissions, this does not mean that this is the only mobile source issue that I am concerned about. I am also concerned about the severity of the reductions in nitrogen oxides, the changes in emissions testing procedures, among others. I am particularly disturbed by the inclusion of a provision regarding carbon dioxide emissions (CO₂) for the first time ever in a Clean Air bill.

No one will deny that cars are part of the problem of ozone pollution, the main constituent of smog, or that they should be part of the solution. The question we face is whether we should take steps to require emissions reductions from cars that the Environmental Protection Agency has estimated will reduce ozone by about 34 - 37%, as the administration's bill would require, or whether we take steps to reduce ozone by 36 - 39%, which is what would be required by the Chairman's bill, S. 1630. (See Exhibit A. S. 1630 is similar to the Waxman bill.)

Why not go with the greater reductions? Because EPA has estimated that reductions similar to those proposed by S. 1630 will increase the cost of reducing ozone from the \$1 billion a year cost of the administration bill by at least \$6.5 billion dollars a year, but produce very small benefits in return.

Let me explain. Under the administration bill the estimated cost of reducing ozone emissions from cars is \$1 billion annually and that investment leads to a 34 to 37% overall reduction in ozone. Does it really make sense to increase those costs by \$6.5 billion to \$7.5 billion annually in order to get a 36 to 39% overall reduction in ozone instead of a 34 to 37% reduction, or what will amount

to about a 2% greater reduction? That is a 600 percent increase in cost for a 2% increase in benefits. (See Exhibit A.)

I believe that is not a reasonable course of action to pursue, and the huge additional cost for the small incremental benefit makes that bill unbalanced and punitive.

The key differences between S. 1630 and the administration bill are the increase in the useful life requirement in current law for 5 years or 50,000 miles to 10 years and 100,000 miles, and the further reduction in emissions standards to 0.125 grams-per-mile (gpm) for hydrocarbons in the year 2003.

The way I read the OTA July 1989 report entitled "Catching Our Breath" and the material it analyzes from its subcontractor, Sierra Research, Inc., the target of .25 gpm in the administration bill for hydrocarbons can be met for 5 years or 50,000 miles of controlled test driving but they are not willing to say or assume that it is likely that a .25 gpm standard could be met over 5 years or 50,000 miles in use. In other words, there is already a major challenge to the auto industry in the administration bill. That is to

meet the .25 gpm standard for 5 years or 50,000 miles in-use.

I believe that the OTA, and Sierra Research which it has hired, would tell you if you asked them that putting in a .25 gpm hydrocarbon standard which must be met in-use over 5 years or 50,000 miles represents a significant challenge. Your bill, Mr. Chairman, increases the severity of that requirement by requiring the standards to be met for 10 years or 100,000 miles!.

Then your bill ratchets down the requirements in a second major way by cutting the .25 gpm standard to .125 gpm. There is great technical question as to whether this is do-able and I believe OTA and Sierra Research would confirm that. The OTA has specifically said in a staff report of 9/21/89 that "we cannot identify technologies that can achieve the final exhaust standard" referring to the .125 standard.

The Environmental Protection Agency assumes that it may be possible to meet these standards but that it makes no economic sense to do so since it estimates it would cost \$7.5 billion annually instead of \$1 billion for the very

marginal reduction that those more severe standards will give you.

I have been working with OTA to develop a chart that would show the ozone reduction potential of the changes that are being debated by the Subcommittee, and the cost per ton of those different strategies. That chart is presented on the easel, and is a combination of information from OTA and EPA. The middle ten bars of the chart, from Gasoline Volatility to Mobile Standards, represent a combination of two charts in OTA's "Catching Our Breath" report. I asked OTA to add a bar that would show mobile source reductions that would result from fleet turn-over, which is what will happen over time without any change in law simply because of new cleaner cars replacing older cars. That is the bar titled Current Law. Even though we are focusing on mobile source issues today, I left the various stationary source categories in this chart as reference points.

The portions of the bars above the solid horizontal line indicate the amount of reduction of hydrocarbon, or volatile organic compounds (VOCs), which OTA believes can be obtained from the various categories. The portions of the bars that are below the line indicate the OTA estimated cost

per ton of reduction of VOC emission for each of the categories. Where OTA has found that there is a range of costs per ton of reduction, that range is represented by the line that extends from the bottom of the bar to the point where it forms an inverted "T". For example, looking at Gasoline Volatility, we can see that OTA predicts a reduction in VOC emissions of 12%, for a cost that is between \$120 to \$760 per ton.

The three bars on the extreme right of the chart have been left unshaded by OTA and us because those emissions reductions will not be effective in 1994, but will be effective in 2004. Looking at the Current Law bar we can see that with no changes in tailpipe standards or any other mobile source changes we will get a better than 6% reduction in VOC emissions. The bar shows that there is no additional cost associated with those reductions, but it would perhaps be more accurate to point out that we've already incurred those costs.

I want to focus briefly on the Mobile Standards bar and the S. 1630 bar at the right of the chart. You'll notice that the S. 1630 bar also has a line extending from the top of the bar. That line represents the possible emissions reductions that could result from S. 1630 assumes those

reductions were achievable. Again, this information is based on the material in OTA's report.

According to that material, standards similar to the administration standard of .25 gpm for hydrocarbons, for 5 years or 50,000 miles of controlled test driving (or certification) only, yields a reduction of hydrocarbons in nonattainment cities of about 140,000 tons per year, from the current standard of .41. Mandating that 0.25 gpm be met in-use, as the administration's bill would do, increases those reductions to about 210,000 tons annually. Going the next two steps, as S. 1630 does, and requiring the .25 standard to be met in-use for 10 years or 100,000 miles, if it were achievable, would increase the reductions to about 250,000 tons per year, and based on the conversations I've had with a variety of sources, the reduction of the .25 gpm standard to .125 gpm could, again if it were achievable, increase those reductions to 300,000 tons per year.

Based on the OTA information and other information I've been able to locate, going from the administration bill to S. 1630 means an increased reduction of about 90,000 tons per year -- the difference between the 210,000 ton per year reduction in the administration bill and the 300,000 ton per year reduction in S. 1630. Now put that 90,000 tons in

perspective. OTA forecasts that mobile source emissions in nonattainment cities in 2004 with no changes in current law will be 4 million tons annually. The administration bill cuts tailpipe emissions 210,000 tons per year off that 4 million. S. 1630 knocks about 300,000 tons per year off the 4 million tons. The incremental gain in S. 1630 over the administration bill is 90,000 tons out of 4 million (or about 2%) at a phenomenal cost.

Once again, the incremental gain of S. 1630 over the administration's bill is represented by the line that extends from the top of the S. 1630 bar.

OTA was able to identify the costs of most of the reductions in ozone forming emissions, but because OTA cannot identify the technology that would be necessary to achieve the requirements of S. 1630 they could not provide me with a cost analysis that I could use to show the cost per ton of reduction from these standards. They were able to estimate that if the reductions were achievable, that they would yield not quite 2% more ozone reduction. (Exhibit A.)

In order to complete the chart, I took EPA's calculation that the difference between the administration

bill and the standards that are similar to the standards in S. 1630 (Exhibit A) would be \$6.5 billion. I then divided the \$6.5 billion by 90,000 tons and got a figure of \$72,000 per ton of VOC reduced. As you can see from this chart, that is an extreme cost. Some people may question my numbers -- but I couldn't find a cost analysis from an unaffected source so I had to approximate this analysis myself.

I would urge the members of the Subcommittee to ask why it is that OTA is reporting that it is not possible to assign a cost to the proposed emissions standards in S. 1630. Shouldn't we know what those costs are, especially in light of the marginal gain in ozone reduction that we'll get from those standards, before we legislate to require that these huge additional costs be incurred?

Mr. Chairman, as I said at the beginning of my testimony, we all want clean air, and we all want to reauthorize the Clean Air Act. Many Senators have stated that we have delayed action in this area too long, and we need to act decisively now. I'm for decisive action that will improve air quality. I'm for a balanced and workable approach that makes substantial improvements in air quality for reasonable costs. I'm for using the nation's resources

for real gains - not billions which could be used for the development of major breakthroughs for the long haul instead of marginal short-term gains.

But, Mr. Chairman, we must strive to avoid getting caught up in one-upmanship by trying to prove who can be the cleanest when it comes to clean air. We may feel good when we pass a bill that has the tightest mobile source standards that can be conceived regardless of economic sense or cost benefit value. We felt good when we passed the catastrophic health care legislation and tax reform legislation that included Section 89. But, those issues deserved more care than went into them, and we also know that we're going to have to open those issues up again and address them more carefully.

I urge you not to approve legislation whose benefit may be very marginal, if you grant the unproven assumption that they are achievable in the first place, but whose costs are huge and punitive. The auto industry has reduced its emissions of 8.8 gpm of hydrocarbons 20 years ago by almost 96% to 0.41 gpm. Few industries which have contributed to improving our air quality have any such record, and Congress' actions contributed to achieving this record. I hope that we'll make a constructive contribution here.

I want to again thank the Subcommittee for allowing me to testify, and I'll be happy to try to answer any questions.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
AIR AND RADIATION

COMPARISON OF MOBILE SOURCE VOC CONTROLS

Control	President	Waxman	Group of 9
Gasoline Volatility	Yes	Yes	Yes
Enhanced I/M	Yes	Yes	Yes
Improved Vehicle Evaporative	Yes	Yes	No
0.25 HC Vehicle Tailpipe	Yes	Yes	Yes
0.125 HC Vehicle Tailpipe	No	Yes	No
Extended Useful Life	No	Yes	No
Refueling Emissions	Yes	Yes	Yes
Clean Fuels	Yes	Yes	Limited
	34 - 37%	36 - 39%	28 %

MOBILE SOURCES VOC CONTROL COST EFFECTIVENESS

	Ozone Reduction	Cost per Vehicle	Annual Cost	Cost per lb Reduction
Waxman Extra Reduction	2.1%	\$500	\$6.6 billion	\$3.1 billion
Waxman Program	36-39%	--	\$7.5 billion*	\$190 million
President's Program	34-37%	--	\$1 billion	\$25 million

* Does not include costs of more expansive I/M program coverage.

PRESIDENT'S BILL ACHIEVES 95% OF WAXMAN'S REDUCTIONS, WITH \$6.5
BILLION LESS COST

STATEMENT OF
GENERAL MOTORS CORPORATION
TO THE
SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

PRESENTED BY
SAMUEL A. LEONARD

SEPTEMBER 28, 1989

WASHINGTON, D. C.

Good afternoon. My name is Samuel A. Leonard. I am Director of Automotive Emission Control for General Motors Corporation. GM appreciates the opportunity to offer our comments on S. 1490 and S. 1630. At the outset, I would like to emphasize that General Motors encourages legislative adjustments to the Clean Air Act which will assure continued air quality improvement. We are confident that this can be accomplished without causing undue disruption of the nation's economy and, in the case of motor vehicles, compromises in their fuel economy, safety, function and/or utility.

These are reasonable goals which we believe can best be accomplished by addressing air quality problems on a regional basis, without imposing costly and unnecessary controls on areas of the country which are already in compliance with established air quality standards. Broad new control measures that would impose excessive economic and social welfare costs while achieving only marginal air quality benefits should be resisted.

According to EPA's most recent air quality data, carbon monoxide levels have continued their steady decline over the last decade. In 1988, only 44 areas, 8 fewer than in 1987, still had not met the carbon monoxide air quality standard. The number of these areas will continue to decrease as emission reductions already mandated by current law come into more widespread use, particularly in the case of motor vehicles.

The situation for ozone is more complex, since ozone is not emitted directly but is formed by chemical reactions in the atmosphere which are

facilitated by high temperatures and sunlight. Because ozone formation is so heavily influenced by atmospheric conditions, the trend of the number of ozone nonattainment areas is much less consistent, at least in the short term, even though emissions of the principal ozone precursors — volatile organic compounds (VOCs) and oxides of nitrogen — have been falling fairly steadily since the late 1970s.

For example, due largely to the record heat and drought during the summer of 1988, 37 areas were added to EPA's ozone nonattainment list. Some maintain that this statistic is proof of worsening air quality across the nation. The fallacy of these claims can be demonstrated by looking at statistics from the summer of 1989, for which preliminary data are beginning to be compiled. These data show sharp reductions in both peak ozone levels and the number of exceedances of the standard, as compared to 1988. A September 20, 1989 article in USA Today compared ozone exceedance days in 1988 and 1989 for a number of cities. New York City went from 28 days in 1988 to 8 days in 1989, Baltimore from 36 days in 1988 to 2 days in 1989, and Cincinnati from 22 to 2 days. Several other cities that had recorded more than 5 exceedances in 1988 recorded only 1, or 0, exceedances in 1989, including Buffalo, Cleveland, Kansas City, and Nashville.

Critics of the industrial community, who last year blamed high ozone levels on industrial emissions, credit this year's improvement almost entirely to weather conditions. Of course, in fact, neither of these claims is entirely true. At least part of the improvement in 1989 was undoubtedly caused by continued emissions reductions produced by another year of new, well-controlled

motor vehicles and industrial facilities replacing older, less-controlled ones. Another part was the result of gasoline volatility controls adopted by EPA last spring. The return of more normal weather conditions was also a factor, although by no means the only factor.

Even without the 1989 data, however, an examination of EPA's 1988 nonattainment data yields persuasive evidence that ozone levels in the nation's cities do not threaten to create a public health crisis. Of the 101 areas listed as nonattainment for ozone, the large majority have design values of 0.15 parts per million or less. Many of the 101 areas exceeded the standard for only a few hours over the three-year statutory compliance period. And there is no substantive evidence that short-term exposure to the levels of ozone found in most nonattainment areas causes anything more than temporary, reversible symptoms of discomfort in humans. Taken together, these data provide no support for the claims that there is a pressing need for immediate, drastic action to reduce emission levels at the cost of major economic and social disruption.

Rather, the data indicate a need for continued steady progress, building on the impressive emission reductions achieved under current law. Motor vehicles are the major success story of the current Clean Air Act. Today's tough passenger car emission standards represent a 96% reduction in hydrocarbon (HC) and carbon monoxide (CO) emissions and a 76% reduction in oxides of nitrogen (NOx) emissions compared with pre-control levels. Similar reductions have been achieved in light and heavy-duty truck emissions.

The road to these improvements in vehicle emissions has not been smooth, fast, or inexpensive. The initial "technology-forcing" standards and deadlines which Congress set in 1970 amid great scientific uncertainty soon proved unrealistic. It took 10 to 15 years, instead of five, to meet most of those initial motor vehicle emission goals.

These reductions were made possible by numerous innovations and improvements in motor vehicle emission control systems. Examples include three-way catalytic converters with computer controlled closed-loop fuel control, improved exhaust gas recirculation, and electronic fuel injection. Today such technology is standard on nearly every new car and light truck sold in the United States.

As we were developing increasingly more effective emission controls, we were also redesigning vehicles for improved fuel efficiency and safety. This challenge has been complex; the costs have been enormous; the results have been impressive.

Further reductions in motor vehicle emissions are assured as new cars and trucks continue to replace older vehicles on the road. The Environmental Protection Agency (EPA) has estimated that by the year 2000, fleet average hydrocarbon (HC) and carbon monoxide (CO) emission levels will decline by an additional 50 percent and oxides of nitrogen (NOx) by an additional 33 percent from current levels.

It is important to recognize that large ambient reductions will occur without tightening existing motor vehicle emission standards. Emissions have been reduced to the point that new vehicles do not contribute significantly to air quality problems. It is older vehicles, with less control than is currently required, that contribute the majority of pollution from motor vehicles. In today's vehicle fleet, 1983 and newer vehicles account for 57% of passenger car miles travelled but produce only 16% of automobile hydrocarbon and carbon monoxide emissions and 28% of emissions of oxides of nitrogen. By contrast, 1974 and older models account for only 7% of passenger car miles travelled, but produce about a quarter of hydrocarbon and carbon monoxide emissions, and 18% of emissions of oxides of nitrogen.

As older vehicles are replaced, emissions will decline naturally, at no incremental cost. Indeed, to the extent that new, tighter emission control standards slow fleet turnover by increasing the cost of new vehicles, adversely affecting performance or driveability, or restricting model availability, air quality improvements will be impaired.

This impairment is compounded by the fact that a further tightening of vehicle emission requirements will have only a minimal air quality benefit compared to vehicle fleet turnover. For example, tightening the car tailpipe hydrocarbon standard by 70% of the remaining emissions (going from 0.41 gpm to 0.125 gpm, which is not technologically feasible), as is proposed in S. 1630, would reduce nationwide annual VOC emissions by only about 1 1/2 percent beyond the 50 percent reductions that are assured under today's standards and fleet turnover rate. Furthermore, because of the incremental nature of fleet

turnover, this minimal reduction would not be achieved for 15 to 20 years from the effective date of the standard.

While we are proud of our mobile control accomplishments, we recognize that certain areas of our nation have not fully achieved attainment of the ambient air quality goals. The areas with the highest levels of pollutants are generally in Southern California. The current Clean Air Act appropriately addresses that unique problem by providing specific authority for California to take independent control actions beyond those needed in the rest of the country. S 1630 would ignore this rational approach by forcing upon the rest of the country unneeded and expensive emission control measures that go beyond even those proposed by California to meet its own unique situation.

This is not to say that new control strategies are not needed to attain and maintain the air quality standards in some other parts of the nation. But in developing such strategies, we should not permit the unique southern California situation to drive us to unnecessarily costly programs for the rest of the country. Instead, we must concentrate on the best overall approach to emissions control for the nation as a whole. In doing so, we believe that Congress should focus upon five key principles when evaluating the need for tighter motor vehicle emission standards:

1. Technological feasibility

Vehicle emission requirements should be based on environmental need and technological feasibility and economic practicality, recognizing that no

breakthrough technologies like the catalytic converter of the mid-Seventies loom on the horizon. Standards which result in appreciable degradation in vehicle fuel economy, performance, safety, driveability, or customer satisfaction are counterproductive because they would retard fleet turnover, and induce "tampering".

Taken as a whole, S. 1630 is not technologically feasible; S. 1490 would take the industry to the edge of technological feasibility.

S. 1490 provides for separate certification and in-use standards. S. 1630, however, provides for no distinction between certification and in-use standards. Under S. 1630, passenger cars and light trucks would be required to meet standards of 0.25 gpm NMHC and 0.4 gpm NOx in both certification and in-use testing. By 2003, the standards would be reduced to .125 gpm HC, .2 gpm NOx and 1.7 gpm CO for all light duty vehicles. In addition, the CO standard for light trucks would be tightened to 4.4 gpm by 1993. These standards should not be enacted. The .125 gpm HC and .2 gpm NOx and 1.7 gpm CO standards proposed for 2003 are not technologically feasible.

2. Cost effectiveness

Clean air proposals should recognize that today's corporations must constantly balance competing priorities in an increasingly competitive global marketplace. Auto manufacturers are faced with multiple regulations in the areas of fuel economy, safety, and chlorofluorocarbon phase-out, in addition to

compliance with the Clean Air Act. This competitive environment highlights the need for cost-effectiveness in legislative proposals.

S. 1490 proposes auto emission standards that would push the industry to the edge of technological feasibility. The bill seeks to assure that manufacturers will be able to comply with the standards without limiting product range (e.g., full-size family cars, fuel-efficient manual transmission cars and trucks, etc.) or product function by means of an emissions averaging program. Thus, S. 1490 directs EPA to develop emissions averaging regulations for the proposed new car and truck standards. Contrary to some contentions, the bill specifically requires EPA to ensure that any emissions averaging program is enforceable and will have no adverse environmental impact. S. 1630 would not allow such averaging.

Emissions averaging, however, is just one way in which S. 1490 considers cost-effectiveness where S. 1630 does not. EPA has estimated the costs and benefits of the mobile source provisions of S. 1490 and compared them to estimates it made for H.R. 2323 — a bill similar in many respects to S. 1630. According to EPA, the mobile source provisions of S. 1490 would cost about \$1 billion per year and would provide 95% of the hydrocarbon emission reductions of the mobile source provisions of S. 1630, which would cost \$7.6 billion per year.

Thus, S. 1490 would be a more cost-effective means of imposing stringent emissions standards without the substantial adverse economic impacts of S.

1630. In short, American consumers can save billions of dollars and still have cleaner air, if the averaging approach of S.1490 is adopted.

3. Separate Certification and In-Use Standards

Clean air proposals should recognize that the same low emission levels achieved in certification cannot realistically be expected to be met in-use. Certification testing relies on accelerated mileage accumulation under controlled conditions on a specific driving cycle. This driving cycle does not capture all of the variety of driving conditions that the vehicles will encounter in the hands of millions of customers, who have different driving habits and live in different climates and geographical areas. It also does not capture such in-use factors as improper maintenance, poor fuel quality, and improper vehicle use. All of these factors are beyond the control of manufacturers.

Manufacturers must target to certify their vehicles and engine families at levels of about 50 percent lower than the nominal in-use standards to account for normal deterioration of properly maintained, used and fueled vehicles. Low emission levels reflected in manufacturer certification data are frequently cited incorrectly as evidence that manufacturers can meet significantly more stringent standards in-use.

S. 1490 recognizes the differences between certification results and in-use performance by setting different standards for each. S. 1630 fails to address this issue.

4. Adequate Lead Time

Adequate lead time to design, develop, test and certify vehicles is necessary in order to produce motor vehicles that have both short- and long-term consumer acceptance and which meet Federal requirements for emissions, fuel economy and safety. Minimum lead time for new vehicle emission standards which are stringent, but feasible, is at least 4 years after test requirements have been defined by EPA.

S. 1490, because of its phase-in schedules, provides this important leadtime; S. 1630 does not.

5. Phase-In of Standards

The ability to transfer technology successfully from the laboratory to production is greatly enhanced if new requirements are phased in. A phase-in allows manufacturers to concentrate their engineering talent on specific models each year, rather than attempt to redesign and certify all new emission control systems in one year. This produces better products for the consumer and for the environment.

A manufacturer must be allowed to phase-in new standards over part of his product line, rather than all engine families at once. S. 1490 recognizes the benefits of phase-in and allows its standards to be met by increasing

percentages of a manufacturer's fleet over 3 years. S. 1630 provides no phase-in period.

The National Highway Traffic Safety Administration (NHTSA) has successfully utilized phase-ins when introducing new safety standards.

COMMENTS ON S. 1490

S. 1490, similar to recent California regulation, stretches industry to the limits of technological feasibility. The bill's passenger car and light truck standards will greatly increase our risk of failure to comply in customer use. While we are willing to accept the risks and challenges of S. 1490 for the most part, we should suggest changes in a few areas of the bill, to reflect more accurately the limits of technological feasibility or to reduce the industry's risk and the public's cost to a level more commensurate with the potential benefits.

The bill recognizes the need for numerically higher standards for trucks than for passenger cars because of the longer compliance period and because trucks are designed and used differently. However, the proposed standards may still prove to be beyond the ability of known technology to meet in-use, especially for heavier trucks. Either the truck standards should be set at numerically less stringent levels, useful life of trucks should be reduced from the current 120,000 mile level to the same 50,000 mile useful life as passenger cars. In addition, the hydrocarbon standards for trucks should be nonmethane,

as in the case of passenger cars, in recognition of the fact that methane emissions make no significant contribution to ozone formation.

o Clean Fuels Program

GM believes that other modifications to S. 1490 should also be made. Following are some of our recommendations.

S. 1490's clean fuels program is an extremely aggressive program that will stretch our resources. We are especially concerned that manufacturers would be required to sell a given number of vehicles. Production capacity is a more appropriate requirement. Also, States that participate in the clean fuel program should be required to adopt measures to encourage the purchase of these vehicles. The bill includes a regulatory review process to address all relevant issues — technology, consumer acceptance, fuel availability/price, air quality benefits, the impact on global warming and on health effects. Implementation of the program should be dependent upon satisfactory resolution of these issues.

GM supports S. 1490's clean fuels program as an innovative approach that recognizes the fact that only minimal air quality improvements can be obtained from more stringent exhaust emission standards. However, details of implementing the program should be modified as follows:

- o Auto manufacturers should not be required to guarantee specific sales volumes. Instead, our responsibility should be to provide adequate production capacity to offer vehicles for sale in the required numbers.

- o State implementation plans (SIPs) for participating areas should be required to include incentives adequate to support the fuel and vehicle volume goals.
- o All fuels (including reformulated gasoline) with comparable potential to reduce overall ozone and air toxics emissions as compared to conventional products should qualify as clean fuels.
- o A joint industry/government research program should be conducted to evaluate open environmental, economic and other issues before requiring high volume production capability.
- o A timely public hearing should be provided to address all open issues and serve as a basis for implementing and continuing the program.

GM believes that other modifications to S. 1490 should also be made.

Following are some of our recommendations:

- o EPA Authority to Revise Standards

The bill gives EPA authority to set more stringent emission standards with only a minimum of criteria to guide the Agency. It forbids the Agency from setting less stringent standards. At a minimum, criteria for EPA administratively setting new standards should be added which include: technological and economic feasibility, air quality benefits, and adequate leadtime.

o Emissions Averaging Program

The emissions averaging program in S. 1490 provides for economic and market incentives that would improve the cost-effectiveness of the overall program. However, in order to be useful in meeting the standards proposed in the bill, implementing regulations must be in place. More specific regulatory timetables should be provided in the emissions averaging section to assure that EPA acts expeditiously.

o Compliance Program Fees

S. 1490 authorizes EPA to charge fees to manufacturers to recover all costs associated with the emissions and fuel economy certification and compliance programs. We strongly disagree with shifting these costs to manufacturers without adequate safeguards. The current need for the Agency to budget for these programs imposes a cost-effectiveness limit on compliance program expenses. Authorizing direct charge-back to the manufacturers, without adequate safeguards, essentially writes the Agency a blank check on the manufacturers without consideration of the cost-benefits of such programs.

o Cold Temperature Carbon Monoxide Emissions

S. 1490 imposes a 10.0 gpm carbon monoxide emission standard for passenger cars when operated at 20° F, with EPA directed to set standards of comparable stringency for light trucks and authorized to set such standards for heavy-duty engines. The standards are to apply to 40% of a manufacturer's fleet in 1993, 80% in 1994, and 100% in 1995. The language allows compliance on a fleet average basis and EPA may permit a different test provided it correlates to operation at 20°F.

GM continues to question the need for a CO standard for cold temperatures. However, if one is adopted, it is critical that compliance be on a fleet average basis and that testing be allowed at 40° F or higher, as long as it correlates to operation at 20°F. The 1993 model year starting date will present extraordinary challenges because of the time necessary to develop a test procedure and build testing facilities. Finally, the leadtime and phase-in for light-duty truck cold CO standards should be made concurrent with other new truck standards, i.e., begin in the 1994 model year, to avoid duplicate certification efforts and the costs associated therewith.

o EPA Information Collection Authority

S. 1490 substantially expands EPA's authority to compel manufacturers to submit materials EPA thinks would "assist" it in rulemaking and to compel manufacturers to perform testing for compliance and rulemaking purposes.

This new authority essentially gives the EPA another "blank check" on manufacturers' resources and open access to all manufacturer information. The unfettered ability to compel disclosure of any information which EPA believes might "assist" in rulemaking is unwarranted. Indeed, this power could have a chilling effect on a manufacturer's willingness to commit resources to programs to improve or evaluate emissions performance, because isolated data taken out of context could easily be misinterpreted.

At a minimum, safeguards should be adopted. EPA should be required to "show cause" for any such information/testing requests. All information requests and any shifting of test burden should be strictly conditioned on specific criteria such as a demonstrated need and an inability on the part of EPA to obtain such information elsewhere.

o Onboard Diagnostic Requirements

S. 1490 authorizes EPA to require onboard diagnostic systems on vehicles to detect "deterioration or malfunction" of emission control components and adds the onboard diagnostic system to the list of parts covered for 5 years/50,000 miles under the section 207(b) performance warranty.

General Motors believes onboard diagnostic systems may one day eliminate the need for inspection and maintenance tailpipe emissions tests. However, the language requiring the system to detect "deterioration" of components which could cause "failure" to meet emission standards is unworkable. To comply literally with this provision would require each vehicle sold to be

equipped with a complete emissions analysis set-up (which costs millions of dollars per vehicle) to monitor and compare emission levels. The words "deterioration or" should be deleted.

o Inspection/Maintenance Testing

S. 1490 requires the EPA to add test procedures to the certification process which would demonstrate compliance with inspection/maintenance requirements under extraordinary conditions, over which manufacturers have little control. We urge that this provision be deleted, as it is an arbitrary requirement with no supportable rationale.

As one way to further improve in-use vehicle emissions, GM supports local enhanced inspection/maintenance programs that can eliminate such conditions as misfueling and tampering. However, the proposal to require manufacturers to certify compliance with diverse and unclear I/M test conditions should be deleted. As written, it could result in very cumbersome and costly test procedures that would not result in any air quality benefit.

o New Civil Penalties

S. 1490 significantly increases civil penalties for commission of the prohibited acts. Civil penalties which apply to manufacturers under current law provide ample authority to handle any problems with manufacturers. The new civil penalties should be deleted.

o NOx Controls

In general, tighter nationwide NOx standards are not necessary because NOx is not a nationwide problem. Only the Los Angeles area exceeds the national ambient air quality standards for NO₂ and California already has adopted tighter NOx standards to address its unique problem.

Even more important, lowering atmospheric NOx levels can cause an increase in the level of ozone in urban areas with low to moderate HC/NOx ratios. According to EPA data, the major urban centers in the Northeast and Midwest have such ratios. In the scientific community, there is now a consensus that NOx control will do two things to ozone in these areas: it will make the peak ozone concentration higher, and it will tend to move the peak ozone back toward the area of highest population. In fact, scientists are convinced that this has happened in Los Angeles — that the NOx control has actually offset the HC control programs which is why we have seen very little progress in reducing ozone levels in Los Angeles has occurred over the last decade. In previous decades, great progress was made in Los Angeles because the emphasis was on HC control alone. Because, from a health risk view, NO₂ is of much less concern than ozone, any further NOx reduction for highly uncertain air quality benefits must be weighed against the accompanying adverse effect on ozone.

Tighter NOx standards also would make manufacturers and the nation more dependent on South African rhodium, a key element in vehicle catalytic converters. The only other major source for rhodium is the Soviet Union.

COMMENTS ON S. 1630

The new control requirements of S. 1630 for cars and trucks are not technologically feasible and in many instances would produce little or no air quality benefit, but would impose huge costs on consumers and producers. The following highlights our major concerns.

Carbon Dioxide Standards

Apparently in an attempt to respond to the global climate change issue, S. 1630 would introduce a new set of standards regulating the amount of carbon dioxide produced by automobiles. Passenger cars would be required to meet a fleet average standard for carbon dioxide of 242 grams per mile in 1995 and 170 gpm by the year 2002. These levels are estimated to be roughly equivalent to fuel economy standards of 35 miles per gallon and 50 miles per gallon, respectively.

The global climate change issue has many long-term implications and scientific uncertainties. The extent and timing of possible climate change, the contribution of identified greenhouse gases to possible changes and the potential implications of any climatic change are all subject to considerable

uncertainty. These uncertainties will not be resolved for years. In light of these uncertainties, policy responses to the possibility of global climate change should be viewed as a kind of insurance policy. The question is: At this time, what, if any, kind of insurance should society buy, and at what cost?

Human contributions of greenhouse gases arise from many everyday activities. No single sector of the United States or world economy can be singled out as the culprit in concerns over possible global climate change. Any policy response ought to recognize that only broadly based policies affecting a wide variety of sources have a chance of affecting the build-up of greenhouse gases.

Public policy should also recognize that addressing the global climate change issue will be very costly because greenhouse gases result from so many different and basic activities. Because responding to the issue will have such a broad impact, it is essential that public policy responses be cost-effective. The cost-effectiveness criterion requires that any policy chosen achieve its goals at minimum cost to society. Imposing policies that are not cost-effective would imperil both economic growth and the political support necessary to address the global climate change issue. Further, scientific research is justified and Gm supports those efforts.

The carbon dioxide standards proposed in S. 1630 fail the critical tests for effective public policies. These standards would impose a unilateral response to an issue of multinational dimensions. They would single out one

source of carbon dioxide for severe limitations. The provision would also superimpose a new command-and-control regulation on top of another command-and-control regulation, the corporate average fuel economy program (CAFE). The CAFE program already imposes competitive hardships on full-line American manufacturers and, thus, provides a competitive boost to the foreign-based producers. The attached copy of our recent testimony on the CAFE program expands on our opposition to any mandated changes in fuel economy.

The emission standards approach would be more difficult for American-based manufacturers to meet on their full line-up of vehicles. Our competitive advantage has traditionally been in the production of larger, better-performing vehicles. Meeting the standards on these sorts of vehicles will be much more difficult and costly than meeting them for small vehicles.

The CAFE approach and the imposition of carbon dioxide standards are too rigid to represent an effective policy response to concerns about the possibility of global climate change. In our view, public policy responses ought to be proportional to the need, as well as flexible, effective and fair. For these reasons, we have urged that the idea of a carbon fee be seriously discussed.

A carbon fee would represent the most direct economic incentive program for dealing with the global climate change issue. It could be implemented by imposing fees for the first sale of fossil fuels proportional to each fuel's carbon content per energy unit. Such an approach would allow an adjustment in the amount of the fee to provide the level of carbon dioxide reductions

dictated by emerging scientific knowledge and economic experience. This flexibility would avoid the danger of overkill and unintended side effects that often result from a standards approach to the issue.

A carbon fee would also be the most cost effective way to regulate the total production of carbon dioxide. It would affect all sources of carbon dioxide on an equivalent basis, thereby providing all users of fossil fuels with appropriate incentives to reduce carbon dioxide. By ensuring that all users of fossil fuels face equivalent costs of reducing carbon dioxide on the margin, a carbon fee would assure that no one sector of the economy would be asked to bear disproportionately high costs of control while less costly carbon dioxide reductions are available elsewhere.

The cost-effectiveness of a carbon fee cannot be duplicated with even a broadly based system of command and control regulations. It is impossible for any regulatory agency to determine the costs of reducing carbon dioxide in the thousands of different uses of fossil fuels in order to set cost-effective carbon dioxide levels for each use. By contrast, a carbon fee, by using market forces to encourage decentralized decision making, would allow the economy to find the least cost means of achieving a given carbon dioxide reduction.

Narrowly based command and control approaches, such as the carbon dioxide standards included in S. 1630, focusing only on a particular use of fossil fuel energy fail the cost effectiveness test even more spectacularly. By attempting to obtain all carbon dioxide reductions from a single source, such programs

could achieve only minimal reductions in carbon dioxide and those at very high costs to one sector of the economy.

S. 1630 threatens to divert the clean air legislative process by including these provisions on the separate issue of fuel economy. Family size cars would essentially be legislated out of existence starting in 1995; by 2002, only vehicles comparable to current subcompacts could be produced, absent a major technological breakthrough. This issue is not appropriate in a Clean Air Act nonattainment bill, and should be deleted.

Exhaust Emission Standards

S. 1630 would impose new exhaust emission standards for cars and trucks that go well beyond future California requirements, and which, in the aggregate, are simply not feasible.

- o The bill proposes two phases of car standards, with phase one effective generally in 1993 and phase two in 2003. Even the proponents of S. 1630 acknowledge that the phase two standards have no basis in technical feasibility and are derived by merely reducing the proposed 1993 standards by half.
- o The bill ignores important functional differences in cars and trucks by requiring smaller, light-duty trucks to meet the same standards as cars.

- o The bill does not provide adequate lead time or phase-in of the proposed standards.
- o No provision is made for even interim separate in-use standards.
- o Proposed hydrocarbon (HC) standards, beginning in 2003, are not set on a nonmethane hydrocarbon (NMHC) basis, which results in standards that are excessively stringent.

Motor Vehicle Useful Life

- o The bill would double the period over which manufacturers must comply with car emission standards from 5 years/50,000 miles to 10 years/100,000 miles. This greatly increases the effective stringency of any numerical standard and does not result in corresponding air quality improvements. A 10 year/100,000 mile requirement, in combination with other provisions, such as the more stringent standards in S. 1630, is not technologically feasible.

Refueling Vapor Controls

- o The bill would also require vehicle (onboard) controls on all new cars and trucks as early as 1993. This requirement ignores the safety concerns of NHTSA and other governmental and public interest safety groups. Further, this requirement imposes costs on all consumers despite the fact that only certain geographic areas have not attained the ozone standard.

- o Several experts, including the Office of Technology Assessment, have determined that alternative methods of controlling refueling emissions would be more cost-effective than onboard controls.

Evaporative Emissions

- o The bill would require EPA to promulgate additional regulations applicable to evaporative emissions of hydrocarbons including running losses. We do not disagree with such regulation and have volunteered to work with the Agency to develop them. However, S. 1630 would have the regulations require "the greatest degree of emission reduction achievable" without any direction given to EPA on how to make that determination. EPA should be directed to give "appropriate consideration to fuel volatility, and to cost, energy and safety factors associated with the application of the appropriate technology" as is the case with S. 1490. Also, the requirement in the bill that such regulations be applicable beginning in the 1994 model year is not appropriate, the starting date should depend on when regulations are finalized and what they require. EPA should set the model year for implementation when they promulgate final rules.

Onboard Emission Diagnostic Systems

- o S. 1630 would require the EPA to promulgate regulations requiring manufacturers to install diagnostic systems on vehicles to detect

"deterioration or malfunction" of emissions related components. The language requiring the system to detect "deterioration" of components which could cause "failure" to meet emission standards is unworkable. The word "deterioration" should be deleted.

Unlike S. 1490, there is no direction given to EPA to consider environmental benefits and economic factors. This should be included.

Further, the 1994 model year implementation may not be appropriate. EPA should have the authority to set the implementation timing as is the case with this requirement in S. 1490.

Use of Information from State Programs

- o The bill would require the EPA, in making determinations of nonconformity, to take into account information collected under state inspection and maintenance (I/M) programs.
- o I/M short tests, while useful in detecting gross emitting vehicles, do not correlate with the elaborate federal test procedure used to certify vehicles. Thus, such test results cannot be used to make judgments of nonconformity. Further, because of differences in testing equipment, procedures and conditions in the various states' I/M programs, the data collected in these programs is highly variable and its use for federal compliance enforcement would be totally inappropriate.

- o Allowing such state I/M program data to trigger recall testing that would be paid for by manufacturers, as Section 213 would do, would effectively punish manufacturers for weaknesses in state programs over which they have no control.

Averaging Prohibited

- o The requirement that "each and every vehicle of engine sold" must meet each emission standard is unreasonable and unnecessary. It is unreasonable because it takes no account of normal production and testing variability, which cannot be eliminated. Taken literally, it would appear to require testing of every vehicle produced, which would be enormously expensive and time-consuming. The requirement is unnecessary because individual vehicles affect air quality only to the extent that they contribute to fleet emissions, which, because they do occur across the fleet, must necessarily be a composite or "average" measurement. Thus, no significant air quality benefit would result from adoption of such a requirement.

Production Line Testing

- o The requirement that at least 90% of vehicles tested must pass selective enforcement audits ignores the fact that variability in the production process and testing in the manufacture of any product does exist, and cannot be entirely eliminated. As standards continue to be tightened, it becomes more and more difficult to achieve the compliance margin necessary

to assure high-level pass rates. Thus, the imposition of a 90% pass rate requirement at the same time standards are being significantly tightened (and in S. 1630, tightened beyond the point of feasibility, in many cases) greatly compounds the difficulty of meeting either goal.

Carbon Monoxide Emissions at Cold Temperatures

- o The cold temperature carbon monoxide standards contained in S. 1630 are similar to those contained in S. 1490, so the earlier comments on S. 1490 would also apply to S. 1630. However, in several important respects, the requirements of S. 1630 are less workable than those in S. 1490. Most importantly, S. 1630 provides no phase-in period for its new standard. A phase-in period is especially necessary in the case of an entirely new requirement, which the cold temperature carbon monoxide standard would be, to allow the opportunity for manufacturers to design the appropriate controls and see how they perform in customer use. Also, manufacturers would have to construct and equip new cold temperature emission testing facilities. A phase-in period would allow the burden on testing facilities and personnel to be spread over several years, thus reducing the number of such facilities that would have to be built.

S. 1630 also specifies the level of the light truck standard for cold temperature carbon monoxide, while S. 1490 would require EPA to set the light truck standard at "a level comparable in stringency to the standard applicable to light-duty vehicles." The S. 1490 approach is preferable to the statutory rigidity S. 1630 would impose.

Finally, S. 1630 contains a second phase of standards effective with the 2000 model year. Given that there has been no showing that such a two-thirds reduction is either necessary for air quality reasons, or technologically feasible, it should not be legislated at this time.

COMMENTS ON OTHER APPROACHES TO IMPROVING AIR QUALITY

Excess Evaporative Emissions/Running Loss Control

S. 1490 would require a 9.0 RVP fuel volatility standard within six months of enactment. The bill also authorizes EPA to control excess evaporative emissions and running losses. S. 1630 includes essentially similar fuel volatility provisions.

General Motors supports RVP controls as the most cost beneficial ozone reduction action available. In addition, we are prepared to redesign systems to further reduce evaporative emissions, given reasonable gasoline volatility controls (9.0 RVP) and reasonable test procedures.

Reformulated Gasoline

General Motors believes that reformulated gasoline should be qualified as an alternative fuel. .

In August of this year, Atlantic Richfield announced a revolutionary new low-emission regular gasoline, to be sold in lieu of leaded gasoline at service stations in Southern California. General Motors has commended ARCO for taking this important step to improve the air quality in Southern California. We believe it is significant that the new fuel has been targeted at older vehicles, the largest source of automotive emissions.

This initiative offers tremendous encouragement to all who are working to improve the quality of our nation's air, and supports the point made earlier in this statement — the most significant air quality gains to be made are related to the existing fleet. Such simple ideas as fleet turnover, reformulated gasoline for older vehicles, and more stringent fuel volatility controls will have a much greater benefits than the technologically infeasible motor vehicle emission standards being considered in S. 1630.

COMMENTS ON STATIONARY SOURCE PROVISIONS OF S. 1630

As discussed above, GM agrees that the Clean Air Act should be amended to ensure continued progress toward attainment of the ozone and carbon monoxide air quality standards. With respect to the stationary source controls addressed in S. 1630, Congress should be guided by three principles:

1. The legislation should contain cost-effective attainment measures that not only permit but encourage aggressive innovation in pollution control to maintain the international competitiveness of domestic industries.

2. Congress should heed the lessons of previous national attainment strategies, and especially avoid a repetition of the simplistic and costly approach of requiring ever-stricter controls on already heavily-regulated sources, which encourages arbitrary and punitive enforcement, strangles competition and threatens jobs, while contributing little or nothing to improved air quality.
3. In view of the scientific and economic complexities of ozone control, Congress should emphasize state-of-the-art local planning and reinvigorate the principle that "the prevention and control of air pollution at its source is the primary responsibility of states and local governments."

GM and other domestic motor vehicle manufacturers have a heavy stake in the stationary source control measures of any Clean Air Act amendments. Motor vehicle manufacturers currently employ approximately 750,000 people at some 340 facilities nationwide. The facilities range in function from auto assembly to chassis/transmission and body/components manufacturing. Most states contain at least one motor vehicle manufacturing facility, and most of these facilities are located in or near large urban areas that are experiencing ozone nonattainment problems.

In 1988, capital outlay by motor vehicle and related industries on new plant and equipment was \$10.6 billion. Of the total employment in this country, 14.7 percent (or 12.3 million people) is involved in occupations in the motor vehicle industry and its major related industries, according to the

most recent Bureau of the Census numbers. Clearly, any new regulation of large stationary sources could have broad economic impacts throughout the nation.

Because auto manufacturing involves large scales operations, they already have been broadly and strictly regulated for VOC control under the Clean Air Act. For example, automobile prime coat operations at assembly plants throughout the nation have been completely redesigned and rebuilt since the 1970s to replace the former high-solvent spray and dip processes with state-of-the-art waterborne electrocoat technology that reduces VOC emissions by 80 to 90 percent from pre-control levels. The high-solvent lacquer topcoat prevalent at GM in the 1970s has given way to today's high-solid enamels and high-efficiency spray systems that also have lowered VOC emissions by 80 to 90 percent from these operations.

In fact, the total replacement of GM's automobile paint shop operations since the late 1970s has required capital investment of over \$3 billion. Those outlays have been made at the same time that manufacturing facilities have been required to make additional efforts, under federal and state laws, to clean up hazardous wastes and improve worker health and safety. In 1988, GM alone spent approximately \$575 million for air, water and solid waste control at manufacturing sites.

Moreover, costs and cost-effectiveness are not the only issues, nor are they necessarily the most important. To survive in today's highly competitive market, U. S. automakers must strive constantly to improve product quality, to shorten leadtimes for introducing new products and implementing state-of-the-

art manufacturing processes, and to reduce production costs. Consequently, the domestic auto industry has a strong interest not only in cost-effective control measures, but also in prompt and reliable regulatory review of plant compliance in an ever-changing production climate.

Indeed, U. S. automakers have a greater stake than most other industries in avoiding unnecessary delays and arbitrary enforcement actions. Motor vehicle manufacturing involves a high degree of integration among many different plants that produce the thousands of parts which make up a finished vehicle. A delay in just one plant can cause delays in others and thus slow the introduction of new products. For U. S. automakers, the capability for rapid response to the market is heightened by the volatile character of consumer automobile demand (which is very sensitive, among other things, to general economic conditions) and the fact that many overseas carmakers are not constrained by potential regulatory delays.

With these factors in mind, it is very disappointing to see that Title I is based exclusively on "command and control" precepts. The bill is totally devoid of any positive incentives for industry to be innovative in reducing emissions.

The array of disincentives written into the bill (emission fees, detailed monitoring/record-keeping/reporting/certification, the active discouragement of modernization via prohibitive offset ratios and time-consuming New Source Review for insignificant sources, increased exposure to massive liability)

cumulatively constitute nothing less than a national policy to deindustrialize nonattainment areas.

Another major disappointment is the strong anti-attainment bias in the bill. This bias is clear in several respects. First, the bill fails utterly to recognize the impossibility of tracking short-term progress in ozone reduction and proving real attainment with the current "extreme value" characteristic of the ambient ozone standards and its widely recognized propensity to vary drastically from year to year, due to meteorological factors beyond human control. Government, industry and the environmental community would all benefit from the identification and use of a more reliable and predictable parameter that would not sacrifice the slightest degree of protection intended under the current standard.

Secondly, the bill requires state and local agencies to expend limited air quality planning resources in developing mandatory "maintenance" plans for populated areas that are unclassifiable as attainment. The same requirement is established as a prerequisite for redesignating a nonattainment area to attainment. The 20-year span required far exceeds the horizon of meaningful projection. This factor, together with the inability to determine true attainment status with the current expression of the ozone standard, undermines the value and integrity of the entire planning process, and diverts resources from the far more necessary task of planning for attainment in nonattainment areas. The result of unnecessary bureaucratic requirements or enforcement actions related to stationary VOC emissions control can be lost sales and, over the long run, diminished market share and domestic employment.

SUMMARY

The last Congress took no action on the Clean Air Act because of the extreme, hard-line positions taken by some of those involved. We urge policymakers to keep in mind that virtually every nonattainment area is in compliance with clean air standards over 99 percent of the time. Continued air quality improvements need to be balanced with continued economic growth that is so important to the nation.

General Motors is proud of its accomplishments in reducing vehicle and plant emissions, and stands ready to participate fully in the work that remains to be done to reach air quality goals. But it is critical that the nation focus its resources on approaches that have the most potential to reduce emissions further, without inflicting undue costs and burdens on any one industry or the citizens of the United States.

COMMENTS OF GENERAL MOTORS CORPORATION
ON PROVISIONS FOR REFUELING EMISSIONS
CONTROL IN S. 1630, THE CLEAN AIR
RESTORATION AND STANDARDS ACT OF 1989

Submitted to the
SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
UNITED STATES SENATE

November 6, 1989

COMMENTS OF GENERAL MOTORS CORPORATION
ON PROVISIONS FOR REFUELING EMISSIONS
CONTROL IN S. 1630, THE CLEAN AIR
RESTORATION AND STANDARDS ACT OF 1989.

Gasoline refueling emissions are primarily a mixture of hydrocarbon vapor and air, which is displaced by the gasoline added to a vehicle's fuel tank during refueling and emitted to the atmosphere. Two fundamentally different methods for refueling emissions control exist. One method uses vapor recovery systems installed on service station gasoline pumps, known as "Stage II" technology. The other method relies on additional hardware installed on board the vehicle itself, referred to as "onboard" technology.

S. 1630 would require deployment of both Stage II and onboard vapor recovery systems in order to control refueling emissions. Its approach to refueling emissions control differs fundamentally from the control strategy adopted years ago by the California Air Resources Board, recommended by the Environmental Protection Agency, and currently under consideration in many States outside California -- which is to require Stage II alone. These comments summarize current expert opinion on the benefits, economic impact and public-safety implications of S. 1630's refueling emissions control strategy.

As the discussion below indicates, the clear preference among the experts now in a choice between Stage II controls and onboard controls is for Stage II controls. Stage II controls can be implemented more safely and quickly than onboard controls. Stage

NOTE: Attachments to this statement have been retained in committee files.

II has also been proven to be at least as effective in controlling refueling-emissions as onboard technology, even under the most optimistic assumptions about onboard's capability. Moreover, Stage II controls can be deployed specifically in the regions of the nation that need refueling control, and thus avoid the costs of a nationwide deployment of vehicle-based onboard controls. By contrast, combining onboard controls with Stage II in the manner proposed by S. 1630 would add little or no environmental benefit in ozone nonattainment areas, but would impose unnecessary expenses and safety risks on the motoring public and the nation.

Part I of these comments reviews the economic and air-quality issues raised by S. 1630's refueling control strategy. (See pp. 3-9 below.) Part II examines the equally important safety issues raised by S. 1630. (See pp. 9-23 below.) Two broad conclusions can be drawn from the expert opinion surveyed below:

- First, S. 1630's requirement of both Stage II and onboard controls is a very costly mistake. Stage II controls are much less expensive than onboard controls as an ozone-attainment control measure. Requiring both would cost the nation more than two billion dollars in control costs over control benefits. (See p. 9 below.)

- Second, S. 1630, by requiring onboard controls without any evaluation of the safety of such a requirement, improperly dismisses the serious concerns about onboard controls raised by the National Highway Traffic Safety Administration and by independent

safety authorities. The safety risks of onboard will overwhelm any air-quality-related health benefits obtainable by requiring onboard controls -- and will do so unnecessarily, in light of the safe and effective Stage II option. (See pp. 22-23 below.)

I. Environmental Benefits and Economic Impact.

The debate over an appropriate refueling emissions control strategy is often unnecessarily confused by a concern that Stage II controls would be required in ozone attainment areas or at the small, "mom-and-pop" filling stations and convenience stores that sell relatively little gasoline. 1/ This confusion is unnecessary because, as explained below, the concern is unfounded.

Every current federal proposal for control of refueling emissions contains an exemption for small filling stations and convenience stores. 2/ Those exemptions are justifiable, from an

1/ See, e.g., transcription of markup, House Subcommittee on Health and the Environment, Sept. 28, 1989 at 8 (remarks of Mr. Sikorski) (attached hereto as Appendix A).

2/ See, e.g., S. 1630 § 107 at 39 (Stage II requirement for State Implementation Plan applies "only to facilities which sell more than 20,000 gallons of gasoline per month"); H.R. 3030 § 103 at 72-73 (exemptions permitted for "owners or operators of gasoline dispensing systems at small gasoline dispensing facilities," and delayed implementation required elsewhere based upon size of operation); S. 1490 § 103 (same as H.R. 3030 § 103); Amendment No. 13, "Ozone Transport Regions," Markup of S. 1630, Subcommittee on Environmental Protection, passed Oct. 26, 1989 (ozone transport region amendment, same as S. 1630 § 107); Amendment in the Nature of a Substitute, House Subcommittee on Health and the Environment (Committee Print) § 103 at 73 (same as H.R. 3030 § 103). EPA's prior Stage II-onboard rulemaking used analyses that assumed exemptions of up to 50,000 gallons a month for independent service stations and 10,000 gallons a month for nonindependent service stations. See EPA, 1 Draft Regulatory Impact Analysis: Proposed Refueling Emissions Regulations for Gasoline-Fueled Motor Vehicles E-10.

environmental perspective, because the quantity of gasoline pumped at those facilities is comparatively small. S. 1630, for example, exempts facilities that sell 20,000 gallons of gasoline or less per month from mandatory coverage in a State Implementation Plan. 3/ Moreover, no federal proposal has ever included a requirement for Stage II controls in ozone attainment areas. Thus, attempts by the proponents of onboard controls to portray Stage II as a requirement for "every gas station in Iowa, Minnesota, or Michigan, or Nevada" 4/ seriously distort the economic issues involved in the debate. The small-station exemptions make it possible to evaluate the nation's two refueling control options based on their merits for the public at large, not their possible consequences for any particular economic sector.

Seen in that light, Stage II controls are easily the better choice. Leaders in the field of regulatory economics have come to that conclusion based on rigorous environmental benefit/cost models that rely on state-of-the-art vehicle emissions data. 5/ But the

3/ See S. 1630 § 107 at 39 (Stage II requirement under proposed new section 183 of the Clean Air Act limited to "facilities which sell more than 20,000 gallons of gasoline per month").

4/ See transcription of markup, House Subcommittee on Health and the Environment at 8 (remarks of Mr. Sikorski).

5/ See Lester B. Lave *et al.*, "Control of Evaporative and Refueling Emissions from Motor Vehicles: A Unified Benefit-Cost Analysis of Fuel Volatility, Stage II and Vehicle Controls" (1989) (prepared for the Motor Vehicle Manufacturers Association of the U.S., Inc.), available from William E. Wecker Associates, 505 San Marin Drive, Novato, California 94947. Similarly, the Office of Technology Assessment's latest comprehensive report on ozone nonattainment strategies finds
(continued...)

basic reasons why Stage II is preferable to onboard controls require no elaborate proof. They are ultimately a matter of common sense, and can be captured in two basic points.

• Regional specificity. Stage II refueling controls need to be implemented only in the specific regions of the country that require additional hydrocarbon controls. By contrast, EPA and Congress have always necessarily assumed that onboard controls would have to be deployed nationwide, including on vehicles sold and operated in areas without an ozone problem. 6/ An onboard strategy, unlike a Stage II strategy, thus incurs costs for consumers who live and work in areas that meet the air quality standard for ozone, and derive only limited benefits from refueling emissions controls.

5/ (...continued)

that Stage II has equivalent or superior cost-effectiveness as a nonattainment control strategy in comparison to onboard controls. See Congress of the United States, Office of Technology Assessment, "Catching Our Breath: Next Steps for Reducing Urban Ozone" 143. OTA, however, apparently does not include the costs of onboard controls in attainment areas in its analysis, see id. at 142, Fig. 6-15 n.*; if those costs were included, the cost-effectiveness analysis would presumably tip much more heavily in favor of Stage II controls. See also United States General Accounting Office, "Air Pollution: EPA's Efforts to Control Vehicle Refueling and Evaporative Emissions" (August 1987) 49 (noting problems with direct cost-effectiveness comparisons). Prof. Lave's analysis avoids the limitations of cost-effectiveness comparisons by using a unified model of emissions benefits and pollution control costs. See Lave et al., op. cit. at 12-14, 17-27. Moreover, Prof. Lave's analysis assures that assumed attainment area ozone control benefits, as well as costs, are included. See id. Appendix E.

6/ See, e.g., 52 Fed. Reg. 31162, 31177 col. 3 (Aug. 19, 1987) ("onboard cannot be implemented solely in non-attainment areas").

• Speed of control. Second, and equally important, onboard controls would work only on vehicles equipped with the necessary control hardware; onboard controls will achieve their full control benefits only after the current vehicle fleet has been replaced by new vehicles -- a process that can take up to 20 years for passenger cars, and even longer in the case of trucks. 7/ Onboard controls do nothing to abate refueling emissions from the millions of cars and trucks on the road today in nonattainment areas. Stage II vapor recovery systems, which can be deployed in a few years' time, control refueling emissions from both new and old vehicles. Stage II controls thus will do more to help bring ozone nonattainment areas into compliance with the standards quickly and on schedule. 8/

Those two basic common-sense factors in favor of Stage II mean that, using any realistic cost estimates for Stage II and onboard controls, Stage II will cost the nation less in its efforts to

7/ See Lave *et al.*, *supra* n.5 Appendix A, p. A-3.

8/ Current designs for onboard vapor recovery equipment use a charcoal canister and a large vapor-carrying line from the fuel tank to remove and store displacement vapor; the canister is "purged" of the vapor by the induction system during vehicle operation. It is sometimes argued that onboard hardware would produce air-quality benefits in addition to refueling emissions control, insofar as it might help control other types of tank vapor emissions called "evaporative" emissions. (Regarding "evaporative" emissions, *see* n.25 *infra*.) Those non-refueling benefits have never been reliably established. Nevertheless, Prof. Lave's analysis gives them full credit in his analysis for MVMA, *see* n.5 *supra*, and Stage II controls still remain the more cost-beneficial control strategy. See Lave *et al.*, *supra* n.5 Appendix C.

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clean up the air. 2/ Indeed, the case for Stage II rather than onboard is now so compelling that the current EPA Administrator reversed the decision of his predecessor in favor of onboard controls, and endorsed Stage II. 10/ In testimony before this Subcommittee in September, the Administrator explained his position in this way:

"Sen. Chafee. EPA, in the past, has ... always tilted toward the on-board controls as opposed to the Stage II. Now, you seem to have reversed, and now you're

2/ Onboard control costs have been estimated by foreign and domestic manufacturers as high as \$80 per unit; a study for MVMA placed the cost at \$35 per unit, with an additional capital cost of \$1 billion. To avoid any bias resulting from the use of those values, Prof. Lave's analysis, see n.5 supra, used the \$25/unit cost developed by the Office of Technology Assessment, see OTA supra n.5 at 146, and zero capital costs. Using that estimate for onboard, Stage II was still the preferred alternative in Prof. Lave's analysis; the net benefits of Stage II exceeded onboard by approximately \$1.6 billion. See Lave et al., supra n.5 at 33. During markup on the House side, Rep. Waxman quoted a \$14 per car estimate for onboard controls, see transcription of markup, House Subcommittee on Health and the Environment, Appendix A at 8; even at that low estimate, the net benefits of Stage II would still exceed onboard by approximately \$346 million in Prof. Lave's analysis.

10/ In the Reagan Administration, EPA Administrator Lee M. Thomas published a Notice of Proposed Rulemaking on August 17, 1987 (the "August 1987 NPRM") that recommended onboard controls if they could be found to be safe. See 52 Fed. Reg. at 31205 (outlining intent to publish further notice on onboard and Stage II following consultation with Secretary of Transportation).

Significantly, EPA's August 1987 NPRM found that the two control strategies had roughly equal non-attainment area hydrocarbon control benefits, and that Stage II had lower per-ton costs on that basis. Id. at 31177 col. 3, 31178 col. 1. The August 1987 NPRM proposed onboard rather than Stage II controls based upon perceived in-use enforcement and effectiveness advantages for onboard, using the information then available to the Agency's staff. Since August 1987, however, new evidence on Stage II's administration in California has upset the key assumptions made in the August 1987 NPRM about in-use enforcement and effectiveness. See Sierra Research, Inc., "An Analysis of Stage II and Onboard Refueling Emissions Control" (Nov. 1988) (prepared for MVMA) (available from Sierra Research, Inc., 1521 I Street, Sacramento, California 95814).

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in favor of the Stage II. My question is why? What caused you to change?

"Mr. Reilly. We looked carefully at both of these options. EPA's past support for on-board controls is well known, as you point out... . We had an election to make. We made it for Stage II refueling controls which, in fact, do target the reductions to the areas most in need of them and can be brought on and have a quicker impact on the problem of reducing pollution... ."

Transcript of Proceedings, Hearing of the Environmental Protection Subcommittee, Senate Committee on the Environment and Public Works, Sept. 26, 1989 (available on Legi-Slate, Sept. 27, 1989). New York, New Jersey and other jurisdictions are pressing ahead with Stage II now as part of the State Implementation Plans; California has used Stage II for years. ^{11/}

Against that backdrop, the approach taken in S. 1630 makes no sense. S. 1630 would require nearly simultaneous deployment of Stage II and onboard controls, and then allow a gradual phase-down of Stage II years later, once EPA finds that onboard-equipped vehicles are in "widespread use." ^{12/} As the Office of Technology

^{11/} EPA first approved the use of Stage II controls as an ozone reduction measure in 1973. See generally Sierra Research, Inc., "An Evaluation of Adopting the California Mobile Source Control Program in the Eight Northeast States" (April 1989) (prepared for Northeast States for Coordinated Air Use Management) 78-80 (regulatory history of Stage II and onboard refueling emissions controls). Massachusetts, like New York and New Jersey, recently resolved to adopt Stage II, and Canadian authorities have also decided to recommend it to Provincial governments as an air pollution control measure.

^{12/} See S. 1630 § 107, 203 at 39, 101. S. 1630 (as amended in markup on October 26) requires inclusion of Stage II in State Implementation Plans for moderate, serious, severe and extreme ozone nonattainment areas and in designated ozone transport regions. See S. 1630 § 107 at 39; Amendment No. 13, "Ozone (continued...)"

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Assessment found earlier this year, however, "the emissions reductions achieved from a combined system do not substantially increase compared to [implementation of Stage II or onboard] separately." 11/ The most recent analysis prepared for OTA indicates that "the higher efficiency of Stage II control systems is actually degraded by the presence of onboard refueling emissions control systems on motor vehicles." 14/ Compared to Stage II alone, the combined Stage II-onboard strategy in S. 1630 would cost the nation more than two billion dollars in control costs over control benefits. 15/

12/ (...continued)

Transport Regions," Markup of S. 1630, Subcommittee on Environmental Protection, passed Oct. 26, 1989. The bill and the amendment provide no indication of when or how the Agency is supposed to make a determination that onboard-equipped vehicles are in "widespread use."

13/ Office of Technology Assessment, supra n.5 at 146.

14/ Sierra Research, Inc., "The Potential for Reducing On-road Vehicle Emissions Through Amendments to the Clean Air Act" (Sept. 1989) (prepared for OTA) 3 (emphasis in original). The loss in efficiency results from a reduction in a Stage II system's ability to control "breathing losses" from service stations' underground storage tanks.

15/ This prediction uses the benefit/cost model described in L. Lave et al., supra n.5. See Appendix B.

Officials of the California Air Resources Board ("CARB") have criticized the double-control strategy of S. 1630, in part because the use of onboard control hardware can diminish the effectiveness of Stage II systems. See Transcript of proceedings, Subcommittee on Environmental Protection, Committee on Environment and Public Works, Sept. 28, 1989 at 92 (remarks of Thomas Cackette, Deputy Exec. Officer, CARB) ("If you have Stage II, then we don't think it makes a lot of sense to have on-board, as well.").

II. Onboard and Stage II Safety.

In addition to being the most cost-beneficial strategy for refueling emissions control, Stage II is the only refueling control technology that can be considered safe for the motoring public. That view is not simply the opinion of automobile manufacturers who oppose onboard; it is the judgment of independent consultants retained by the Department of Transportation's National Highway Traffic Safety Administration ("NHTSA"). In a report released earlier this year, NHTSA's consultants reviewed all the evidence and analysis bearing on onboard safety, and concluded that "there are indeed potential safety risks associated with onboard systems." ^{16/} Stage II systems, according to NHTSA's consultant, were the better alternative from a safety perspective:

"There is an alternative to onboard systems (i.e., Stage II control systems) which adds no incremental risk while operating the vehicle. These systems are proven and have been made more efficient based on extensive in-use experience. They can be implemented in a much shorter period of time than onboard systems which require a complete fleet changeover. The incidence of fires at gasoline stations has decreased in California where Stage II controls have been in place the longest."

See A. D. Little, Inc., "An Assessment of Key Safety Issues Associated with Onboard Vapor Recovery Systems" (June 1989) (hereinafter "A. D. Little Report") at 6-3.

^{16/} Arthur D. Little, Inc., "An Assessment of Key Safety Issues Associated with Onboard Vapor Recovery Systems" (June 1989) (hereinafter "A. D. Little report") § 1 at 1.

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The experts at NHTSA and elsewhere have categorized the safety problems with onboard into three broad areas, which we review in turn below. (See pp. 11-21.) We then briefly examine the evidence relating to the safety benefits of Stage II. (See pp. 22-23.)

A. Explosions and fires from vapor leaks.

The intended function of an onboard control system is to remove the vapor displaced from a vehicle's fuel tank, place it in a charcoal canister elsewhere on the vehicle, and then to store the vapor in the canister until the engine can "purge" the canister by burning it during vehicle operation. About 1.34 cubic feet of gasoline vapor and air are typically displaced from a fuel tank during a 10-gallon fill, over a period of one to two minutes. ^{17/}

The gasoline-air mixture from the fuel tank, in an undiluted state, is ordinarily too rich to be combustible. If, however, the mixture is diluted in air as a result of a leak in the onboard system's vapor containment hardware, it can easily produce a combustible mixture; the volume of that combustible mixture will probably be significantly larger than 1.34 cubic feet for a 10-gallon fill. Importantly, those leaks can pass undetected for many refuelings, and can also result from tampering. ^{18/} If a gasoline

^{17/} A.D. Little report § 2 at 2-13.

^{18/} See, A. D. Little report § 3 at 3-25 ("Many failures ... may not be readily detected unless a safety problem results."). Tampering of emission control systems is common today. While new vehicle inspection/maintenance provisions (continued...)

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vapor/air leak comes into contact with an ignition source, such as a spark from an electrical component or from a stray cigarette or match, an explosion and a fire can result.

NHTSA's onboard safety consultant was unable to quantify the frequency with which explosions and fires would result from vapor leaks, because there are obviously no in-service data on vehicles equipped with onboard controls available for analysis. ^{19/} However, using standard risk analytical techniques, a report prepared for General Motors by an independent engineering firm estimated that the incremental fire risk created by onboard controls could result in "an increase of more than 100 percent in non-collision fires associated with vehicle refueling, contributing 100 or more additional non-collision fires per year to the national total." ^{20/}

Any vehicle fire is a significant safety problem; in the aggregate, vehicle fires contribute to many of the deaths and injuries on American highways today. Even if one assigns comparatively large values to the health benefits resulting from the ozone

^{18/} (...continued)

and other changes in the Clean Air Act are expected to help reduce the incidence of motor vehicle tampering, and thus to produce emissions reduction benefits, they cannot be expected to eliminate tampering, and the safety problems raised by tampering will not be eliminated.

^{19/} See A. D. Little report § 1 at 1-1.

^{20/} See Failure Analysis Associates, Inc., "An Analysis of the U.S. Environmental Protection Agency's August 1988 Draft Report 'Summary and Analysis of Comments Regarding the Potential Safety Implications of Onboard Vapor Recovery Systems'" (February 1989) (hereinafter "FaAA 1989 report") 16.

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reductions achieved by refueling emissions control, a small increase in the incidence of vehicle fires (much smaller than projected by the analysis prepared for GM) will offset the health benefits of ozone control. Those additional vehicle fires would not occur in the first place, if Stage II controls rather than onboard controls were used to capture refueling emissions. The risks of injury and death that S. 1630 would require the public to accept are simply unnecessary.

B. Additional collision fires.

Many of the components required for an onboard vapor recovery system will be located in so-called vehicle "crush zones" -- areas of the car or truck that are frequently damaged in collisions. The potential for an increased incidence of vehicle fires in collision situations as a result of onboard hardware has been confirmed with vehicle testing, ^{21/} and has been estimated by GM's independent onboard safety analyst to result in a possible "5 to 20 percent increase in non-fatal and fatal collision vehicle fires." ^{22/} This fire risk has been one of the principal reasons why independent

^{21/} See, e.g., Failure Analysis Associates, Inc., "30 MPH Side Impact Crash Test -- 1985 Buick Century with Mobil Oil Co. Onboard Refueling Vapor Recovery System" (February 1988).

^{22/} FAA 1989 report at 16.

groups like the Insurance Institute for Highway Safety have consistently opposed onboard controls. 23/

The 5-to-20-percent estimate from the analysis performed for GM, if borne out by experience, would mean anywhere from several hundred to several thousand additional collision vehicle fires each year. Whatever the absolute number of collision vehicle fires, there is no question that even a small increase in their number would result in additional vehicle fatalities. NHTSA data show that there were 1,566 fatalities associated with accident-related vehicle fires in 1985; fire was listed as the "most harmful event" for 571 of those deaths. 24/

Proponents of onboard controls have tried to discount the risk of additional collision vehicle fires by arguing that onboard systems are similar to currently-used evaporative emissions control

23/ See letter from Brian O'Neill, Insurance Institute for Highway Safety, to Hon. John D. Dingell, August 12, 1988 ("The Institute [is] concerned that on-board systems for the purpose of recovering vapors during refueling will add unnecessary complexity, which in turn will increase the risk of post-crash fires as well as of safety-related manufacturing defects."); letter from Brian O'Neill, Insurance Institute for Highway Safety, to Charles L. Gray, Jr., EPA, March 23, 1988 ("We are opposed to the installation of on-board refueling vapor recovery devices" because the "increased complexity of on-board devices would increase fuel-system vulnerability and would, therefore, increase the risk of additional motor vehicle deaths and injuries."); letter from Brian O'Neill, Insurance Institute for Highway Safety, to Hon. J. Craig Potter, EPA, December 12, 1986 ("on-board controls will without doubt increase the frequency of fires"); letter from Brian O'Neill, Insurance Institute for Highway Safety, to Hon. Lee M. Thomas, EPA, September 23, 1986 (onboard controls would result in "an increase in the likelihood of people being burned, even fatally burned, in post-crash fires when the lines rupture or when other parts of the complex fuel system fail.").

24/ See A. D. Little report § 2 at 2-53 to 2-54.

systems, which also employ tank vent lines and a charcoal storage canister. 25/ Accepting the argument's premise, 26/ it is instructive to note that the introduction of evaporative emissions controls in the early 1970's was itself associated with an increase in fatal and non-fatal collision fires. Statistical comparisons prepared for GM, using data from the Fatal Accident Reporting System (FARS) and from other sources, have shown a dramatic increase in the odds of a collision fire following introduction of evaporative controls at the federal level in 1971: implementation of evaporative controls was linked to an approximate 18 percent increase in the rate of fatal-collision vehicle fires, and an approximate 12 percent increase in the rate of all-collision fires. 27/ Thus, the comparison to evaporative controls, far from

25/ Evaporative emissions control systems are used to store and purge vapor generated in the fuel tank and the fuel system by heat, either from vehicle operation or from daily sun load. The rate at which evaporative vapor is generated by a vehicle fueled with properly-matched gasoline is generally far less than the rate at which refueling can generate displacement vapor. Consequently, the components and systems capabilities of evaporative controls are generally far smaller than would be required for onboard refueling vapor recovery.

26/ The assumption that onboard systems will be functionally similar or similar in design to evaporative systems is a hotly-disputed claim. NHTSA's contractor, for example, believes that production onboard systems would probably be "more complex and more expensive" than the so-called "simple" onboard prototype systems based on current evaporative control assemblies that were developed in 1987 and 1988. See A. D. Little report § 3 at 3-2; see also n.28 below.

27/ See Failure Analysis Associates, Inc., "Safety Issues in Systems Designed to Recover Gasoline Vapor during Motor Vehicle Refueling" (Feb. 5, 1988) (hereinafter "FaAA 1988 report") 12. It is important to note in reviewing the safety evidence relating to evaporative controls that in 1971, when EPA introduced them, there were no equivalent alternative technologies for control of evaporative emissions.

allaying concerns about onboard safety in crash situations, actually confirms them.

C. Other onboard-related safety risks.

Proponents of onboard controls have also tried to demonstrate that significant concerns about vehicle safety are unfounded, or can be readily resolved, by modifying current production vehicles with onboard control prototype hardware. The purpose of the modifications has apparently been to show that onboard systems add little complexity to vehicle fuel and evaporative controls, and can be designed to function well under in-use conditions. 28/ The American Petroleum Institute ("API") provided one such modified vehicle to NHTSA for evaluation in 1988.

The API vehicle could not be subjected to rollover or crash tests by NHTSA, or to a NHTSA-led defect/failure mode effects analysis ("DFMEA"), which is a standard part of any thorough safety evaluation of a new vehicle system. Those steps proved to be unnecessary, because the API vehicle was found to be unsafe for

28/ One such prototype design was developed by the American Petroleum Institute, an opponent of Stage II controls, in the summer of 1988. The American Petroleum Institute's onboard hardware was similar in concept to a design promoted by EPA Administrator Thomas and the staff who prepared the August 1986 NPRM, called the "EPA simple system." See docket item No. IV-D-57, EPA Docket No. A-87-11 (American Petroleum Institute materials presented at meeting with National Highway Traffic Safety Administration, July 15, 1988) (claiming, *inter alia*, "99% control of refueling emissions demonstrated"); see also n.30 *infra* (subsequent EPA emissions testing of another API-modified vehicle showed failures).

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other reasons. NHTSA's consultant summarized the problems found by the NHTSA staff this way:

"The oil industry, represented by the American Petroleum Institute (API), reported that its own test vehicle had an improved design and retained good emission control, presumably meaning that it had fewer operational or safety problems than those experienced with the simple system...."

"NHTSA's extensive test drive experience with the API vehicle indicates that it does not appear to have a safe onboard system, and further, did not perform safely in real-world operating conditions. The vehicle showed consistent refueling problems at gasoline stations (numerous nozzle shut-offs and fuel spills), fuel leakage problems after overfills (driving away and parked), and driveability problems on roadways after the refuelings (engine hesitation and cut-offs). Each of these problems led to decreased vehicle safety due to fuel spillage or stalling. Further, visible fumes were noted exiting the fill pipe during fill-ups, indicating that emission control may not be completely maintained during actual use."

See A. D. Little Report at 2-29, 2-33 (emphasis added). 29/ The

29/ See also "Summary of Driver Comments -- NHTSA Testing of API Test Vehicle," attached as Appendix C. The NHTSA staff reported that on one particularly hot day, a seven-gallon fill of the API vehicle (a modified 1987 Buick LeSabre) "took a total of 11 minutes," during which "[t]he nozzle clicked off 109 times in the process," and "fuel was expelled from the tank when it was finally filled." See Appendix C at 1. On another occasion, the NHTSA test driver reported it was "almost impossible" to attain a 55-mph speed on the freeway and that the "vehicle started to cut out, as if I was turning the key on and off very quickly." Id. at 2. A second driver, operating the vehicle another day, similarly reported "bucking and cutting out continuously" when entering expressway traffic, and wrote that "[t]here was doubt in my mind, as well as in the minds of the passengers ... as to whether [the] car would continue to run..." Id. The NHTSA staff concluded as follows:

"On many occasions it was difficult to refuel [the vehicle], and at the very slow refueling rates sometimes necessary, fuel vapors could be observed coming out the fuel filler pipe. The vehicle also demonstrated serious driveability problems on four different
(continued...)"

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problems with the API onboard design were not limited to driveability and ease of refueling. A similar vehicle failed refueling emissions tests at EPA's Ann Arbor facility. 10/

The performance of the API vehicle appeared to NHTSA to refute claims that a "simple" and supposedly safe onboard system was currently available, and created new concerns about the hot-weather driveability of onboard-equipped vehicles. 11/ The Insurance Institute for Highway Safety added its support to the concerns expressed by NHTSA. 12/ The upshot has been that despite the concerted efforts of supporters of the onboard alternative, there is still no onboard prototype design that the independent motor

29/ (...continued)

occasions. In all cases the driveability problems appeared to be related to the refueling of the vehicle."

Appendix C at 4 (emphasis added).

30/ See memorandum from David B. Bartus, EPA, to EPA Docket No. A-87-11, Oct. 24, 1988, entitled "EPA Testing of API Sponsored Vehicles Equipped with Onboard Refueling Emissions Control Systems" at 4 (vehicles failed five out of six refueling emissions control tests.)

31/ NHTSA's contractor saw poor driveability as a potential problem in two respects: first, as an "incentive to tamper" which increases fire risk, see A. D. Little report § 1 at 1-2, and second, as an additional source or category of "traffic accident risks," see id. § 5 at 5-12. See also id. § 4 at 4-12, 4-16 (terming driveability problems "of considerable concern").

32/ The Institute, after reviewing the NHTSA driver diaries from the API vehicle, see n.29 supra, noted the "additional safety problems involving operational and driveability issues" raised by the NHTSA evaluation, and opined that "[i]n today's environment of high traffic volumes and fast travel speeds, driveability problems, especially if they lead to stalling, are indeed safety problems." Letter from Brian O'Neill, Insurance Institute for Highway Safety, to Hon. John D. Dingell, Aug. 12, 1988.

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vehicle safety community has been able to endorse as even arguably safe. 33/

D. The issue of leadtime.

Some proponents of onboard controls -- again, from the petroleum industry -- also argue that the safety problems presented by onboard are overstated, and in any event can be eliminated, if enough leadtime is allowed. The following statement in a "Point Paper" distributed by the Petroleum Marketers Association of America is typical:

"To the extent [onboard] safety concerns can be validated, they can be dealt with in the time frame allowed under most of the proposals requiring onboard canisters."

See Memorandum from Phillip R. Chisholm, Executive Vice President, Petroleum Marketers Association of America, to Member Associate Executives et al., Sept. 8, 1989 at 3 (attached).

That view is not shared by knowledgeable automotive safety experts, the American Automobile Association ("AAA"), or the

33/ Apparently, only two organizations outside the petroleum industry that commented on EPA's 1987 onboard proposal have ever disagreed with the general concern about safety voiced by NHTSA and the Insurance Institute for Highway Safety, and their current position is unclear. The Center for Auto Safety ("CFAS") and the Natural Resources Defense Council ("NRDC") expressed a belief that onboard controls would enhance vehicle safety in 1988, prior to the publication of the safety report in June 1989 by NHTSA's consultant. Their comments, however, were unaccompanied by any test data or detailed vehicle evaluations, and preceded the most recent wave of testing and evaluations by the NHTSA staff and others. NHTSA's consultant noted in its June 1989 report "that after NHTSA staff reviewed and submitted generally negative comments on the validity of [the CFAS/NRDC] conclusions to the EPA in a letter dated April 12, 1988, and these comments were forwarded to the [CFAS], the Center did not respond to NHTSA's findings on [CFAS'] work." See A. D. Little report § 2 at 2-28.

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Insurance Institute for Highway Safety. ^{34/} As AAA wrote earlier this year, the onboard-Stage II "safety controversy is unprecedented in vehicle pollution control strategies," and cannot be solved by "step[ping] back and let[ting] the vehicle industry resolve the safety dispute through trial and error." ^{35/} The reason independent organizations are unimpressed by leadtime arguments is easy to understand.

First, any automotive safety expert will concede that even with unrestricted leadtime, errors in vehicle assembly and servicing will occur, despite the best efforts of automobile manufacturers and the service industry. Additionally, failures due to component deterioration, damage and tampering beyond the control of any manufacturer or repairman will occur in some vehicles; pre-release engineering can minimize, but never eliminate, those types of failures. Some motor vehicle operators will inevitably be exposed to incremental risk regardless of the amount of leadtime available to manufacturers.

^{34/} See, e.g., letter from the Insurance Institute for Highway Safety, *supra* n.23; letter from Charles M. Trubas, State Farm Ins. Co., to EPA, Feb. 11, 1988 (available as item no. IV-D-345 in EPA Docket No. A-87-11); Comments of American Automobile Association on EPA's August 1987 NPRM, Feb. 10, 1988 (available as item no. IV-D-327 in EPA Docket No. A-87-11); letter from Frank W. Kraus, National Association of Fleet Administrators, to EPA, Feb. 2, 1988 (available as item no. IV-D-282 in EPA Docket No. A-87-11); letter from Thomas O. Reel, Traffic Safety Association of Michigan, to EPA, Feb. 4, 1988 (available as item no. IV-D-316 in EPA Docket No. A-87-11).

^{35/} See Comments of AAA on EPA's August NPRM, *supra* n.34.

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Moreover, as NHTSA's safety consultant has recognized, "Even if safe and effective onboard systems can be developed, each new vehicle model will present a new opportunity for design or manufacturing complications and/or errors which could have safety implications." 36/ This is a crucial point. As Brian O'Neill, President of the Insurance Institute for Highway Safety, has written:

"The on-board system would require complex additional [hardware] to store captured vapors. The result [is] an increase in the likelihood of people being burned, even fatally burned, in post-crash fires when the lines rupture or when other parts of the complex fuel system fail. ...

"A regulation requiring automobile fuel systems to become more complex doesn't make sense. Why choose ... an alternative that would have the horrible consequence of burning people in crashes?"

See Letter from Brian O'Neill to Lee M. Thomas, September 23, 1986 (attached as Appendix D). Even if an onboard system could be devised that was shown to be both safe and effective in a development program, the rich diversity of individual vehicle models and design changes will therefore create continuous opportunities for errors that may have adverse safety consequences. 37/ Even with the best efforts of the engineering community, more leadtime would do little or nothing to reduce the long-term risks of onboard.

36/ See A. D. Little report § 1 at 1-2.

37/ This point is borne out by what NHTSA's consultant considered to be the persistent evidence of safety problems with evaporative controls, which have now been in production for almost 20 years. See A. D. Little report § 6 at 6-1.

2. The safety benefits of Stage II.

Since the publication of the NHTSA consultant's findings earlier this year, only the petroleum-industry supporters of onboard have remained comfortable with the safety risks of onboard. These risks are particularly unacceptable because (as noted by NHTSA's consultant) there is another, safe alternative control technology -- Stage II. ^{38/} Stage II controls have been used for many years in California, where they have achieved a control effectiveness for refueling emissions well above 90 percent. ^{39/}

In California, Stage II has been found actually to enhance the safety of refueling operations. ^{40/} Data maintained by the U.S. Fire Administration and by individual States show a 50 percent lower rate of gasoline fires at gas stations in California than in

^{38/} In selecting a control strategy for refueling emissions, the options available to the government today are thus quite unlike those that confronted the federal government in the late 1960's and early 1970's, when evaporative controls were instituted; at that time there was no perceived alternative to vehicle-based hardware to control the emissions of concern, i.e., evaporative emissions.

^{39/} See Sierra Research, Inc., supra n.10. Significantly, the Sierra Research report uses data and analysis not available to EPA in 1987 when it published the August 1987 NPRM. EPA apparently did not analyze or comment upon Sierra Research's late-1988 analysis prior to Administrator Reilly's arrival at EPA, and the change in EPA's position on the onboard-Stage II question.

^{40/} Stage II controls enhance the safety of refueling because they reduce the possibility of liquid fuel spills and vapor ignition, and generally involve better maintenance of the fuel dispenser and its hoses. See FaAA 1988 report at 59 (noting that "currently in-use [Stage II] systems (in California) provide an automatic fuel cut-off in the event of an improper seal of the vapor recovery boot," that "gasoline vapors are contained" by Stage II systems, and that "increased attention ... is directed to refueling by gas station attendants and self-service customers using Stage II systems.").

non-Stage II states. 41/ If Stage II were implemented federally in ozone-nonattainment areas, these data indicate that approximately 25 casualties a year from service station fires could be prevented nationwide each year. 42/

The safety benefits of Stage II have received little public attention to date, largely because organizations like the Petroleum Marketers Association of America choose not to discuss them. However, the fact that these benefits exist has never been effectively questioned in the technical literature, 43/ and was endorsed in the report on onboard safety earlier this year by NHTSA's consultant. 44/ Any State that is serious about clean air can be

41/ See FaAA 1988 report at 46-75. The 50-percent lower rate appears both in the U.S. Fire Administration data set (to which more than 40 States contributed in 1988) and from an in-depth review of fire reports from five States (California, Illinois, Michigan, Ohio and Texas). Id. at 46, 55.

42/ See FaAA 1988 report at 54 (analysis based on U.S. Fire Administration data; assumes allowance of exemption from Stage II for small service stations and convenience stores).

43/ The EPA staff who prepared the August 1987 NPRM attempted in 1988 to criticize the FaAA 1988 report's Stage II safety-benefits analysis. The staff noted that California had an effective Stage II inspection and enforcement program, which may account for the difference between the fire rate in California and in non-Stage II States. The staff's inference only supports the FaAA 1988 report's ultimate conclusion -- that Stage II-equipped stations are likely to be safer than non-Stage II stations.

44/ See A. D. Little report § 3, at 3-25 to 3-30.

expected to obtain this added safety benefit when it implements Stage II. 45/

Conclusion

Stage II systems can achieve refueling emissions control more cheaply, quickly and cost-effectively than onboard controls. They can also do so without any incremental risk to motor vehicle safety, and in fact can reduce the incidence of service station fires, injuries and deaths. S. 1630 therefore correctly requires Stage II in ozone-nonattainment areas and transport regions.

S. 1630 errs in requiring onboard controls in addition to Stage II. The Office of Technology Assessment has found that there would be no appreciable additional reduction in the nonattainment-area refueling emissions inventory as a result of such a double-control strategy; the strategy selected in S. 1630 would cost the nation more than two billion dollars in economic costs over benefits. It will also create safety risks which, since the publication of NHTSA's special safety report earlier this year, no disinterested public or private organization considers acceptable

45/ S. 1630 would effectively give up that benefit, by phasing down Stage II once onboard entered "widespread use." Moreover, S. 1630's provision for phase-down of Stage II could also lead to a gradual reduction in maintenance of Stage II systems in areas designated for phase-down, even before the Stage II requirement was formally eliminated. To the extent that improved equipment maintenance is one reason why Stage II reduces fire risks, see n.40 supra, such an approach would itself degrade the safety benefits of Stage II, even while Stage II was nominally required.

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or necessary, in light of the Stage II alternative. S. 1630 should be amended to delete the onboard requirement.



Environmental Activities Staff
General Motors Corporation
General Motors Technical Center
30400 Mound Road
Warren, Michigan 48090 9015

FE: 4464
November 1, 1989

The Honorable Joseph I. Lieberman
U. S. Senate
Hart Office Building (Room 502)
Washington, D.C. 20510

Dear Senator Lieberman:

In connection with the Senate Environment and Public Works Subcommittee on Environmental Protection's September 29, 1989 hearing on the proposed amendment to the Clean Air Act, you requested that General Motors respond to several follow-up questions. Our answers to your questions are attached, and we request that they be included in the hearing record. Although some of the questions were directed to witnesses other than GM, we responded to several of these as well, because of the importance of the issues. I hope that this information is useful to you and the rest of the Subcommittee in your consideration of the Clean Air Act amendments.

Sincerely,

Samuel A. Leonard, Director
Automotive Emission Control



Let's Get It Together
SAFETY BELTS SAVE LIVES

GM Responses to Senator Lieberman's Questions

Question 1

I have reviewed your data, which shows that the average in-use GM car emissions from 1987 is about .6 NOX, .25 hydrocarbons and 3.4 CO for 50,000 miles. For 1985-87, your data shows a gradual reduction in each of the three pollutants.

Based on this data, it seems clear to me that you certainly will have no trouble meeting the Committee's standards in 1995 and, with a little work, meeting the 2003 standards. Could you explain to me why this conclusion is wrong?

Ans. As noted in the question the cited data represent average emissions over a 50,000 mile useful life, and as such are not directly comparable to the standards proposed in S. 1630. Under S. 1630, the proposed standards could not be met on an average basis. The current average level is the result of some cars which emit less than 0.25 grams per mile hydrocarbon, and some that emit more. These latter vehicles could not continue to be produced under S. 1630 unless further emissions reductions were achieved. Even vehicles which are currently emitting at, or slightly less than, 0.25 grams per mile would have to be improved to create an adequate margin of compliance to reduce the risk of recall. A compliance margin is necessary to allow for variation in the production process, a wide range of operating conditions in actual customer use, and variability in in-use emission testing procedures and results. Absent some compliance margin, we may as well decide whether to recall based on the flip of a coin. Thus, meeting a standard on average is not an indication that the standard is feasible for an entire product line.

Also, S. 1630 would extend the useful life over which the standards would have to be met to 10 years/100,000 miles, as compared to the 5 year/50,000 mile current useful life. Because the effectiveness and efficiency of emission control systems deteriorate as they are used and subjected to normal, or abnormal, wear-and-tear, vehicle emissions increase with time and mileage. The 100% increase in useful life proposed in S. 1630 would nearly double the difficulty of meeting even the current standards. When combined with the tighter numerical standards proposed for 1993, and with the other proposed changes in testing and compliance procedures, meeting these requirements across a broad product line by 1993 will be very costly to consumers and challenging from an engineering perspective. And, as we have said on numerous prior occasions, meeting the standards proposed for 2003 will not be possible, absent a major technological breakthrough.

Question 2

Are you aware that ARCO is working on a reformulated gasoline? Have you considered how this might help you meet the second round of tailpipe standards?

Ans. Yes. We are well aware of ARCO's reformulated gasoline, and are optimistic about its future role in the improvement of the nation's air quality. In this regard, GM and the other two domestic automakers and 14 major petroleum companies announced on October 17 a comprehensive joint research and testing program involving a wide range of fuels for use in both current and future model cars and trucks.

This program is in support of President Bush's Clean Air Act proposal, which, for the first time, considers cars and trucks and the fuels they use as a total system. The first phase, which we hope to complete by mid-1990, is targeted at the fact-finding proceedings called for in the President's proposal. A second phase will investigate more advanced vehicles and fuels and provide additional data for those proceedings. We have designed the program to produce the best possible data with respect to representative alternative fuels such as reformulated gasoline and methanol.

The program's results will permit objective assessment of relative reductions in vehicles emissions and improvements in urban air quality, especially ozone, achievable with reformulated gasolines and with methanol fuels. The program will also evaluate ethanol as an additive to reformulated gasoline.

However, at this point, research on reformulated gasoline for use in current production vehicles is at a relatively early stage. Because the fuel has not yet been developed, let alone tested, it is not possible to evaluate the extent to which it may be helpful in meeting the second round of tailpipe standards. The emissions benefits of reformulated gasoline, or other potential "clean fuels" may be less than is currently anticipated. The second round of tailpipe standards, representing as they do a further 50% reduction from the first-round standards, will require major breakthroughs in technology, even if reformulated gasoline does prove to be significantly cleaner than today's gasoline. Thus, setting statutory emission standards based on potential benefits of any yet-to-be-developed fuels is at best premature, since these standards may likely prove impossible to meet even with reformulated gasoline.

Question 3

The auto industry contends that there has been a 96 percent reduction in auto emissions since 1970 and that the second round would result in very little improvement. Do you believe that this is an accurate analysis?

Ans. Yes. Compared to the uncontrolled cars of the 1960s, the 1989 emission requirements represent a 96 percent reduction for both hydrocarbons and carbon monoxide, and a 76 percent reduction for oxides of nitrogen. Similar reductions have been achieved in truck emissions.

However, less than half the vehicles on the road today were built to the latest emission standards. The older vehicles account for almost 90% of the motor vehicle fleet hydrocarbon and carbon monoxide emissions and more than 70% of the oxides of nitrogen even though they account for only about 40% of the miles driven. Thus, as fleet turnover occurs and less controlled vehicles are replaced with new cars equipped to meet today's tough emission standards, our nation's air quality will see significant further improvement.

As shown on the attached chart prepared by EPA, mobile source emissions of hydrocarbons will fall substantially over the next 16 years, even with no change in current law. The Administration proposal would result in further reductions, so that mobile source emissions of hydrocarbons in 2005 would be 77% lower than current levels.

A further tightening of vehicle emission requirements will have only a minimal additional air quality benefit. For example, standards proposed for 2003 in S. 1630 (a reduction from 0.25 gpm to 0.125 gpm, which is not considered technologically feasible), would, according to EPA, reduce nationwide annual VOC emissions by less than 1%. Furthermore, because of the incremental nature of fleet turnover, this minimal reduction would not be achieved for 15 to 20 years from the effective date of the standard, or sometime between 2018 and 2023.

EPA has testified that this negligible reduction could cost consumers up to \$7 billion per year. At the Subcommittee's September 28 hearing, Senator Levin, using estimates from EPA and the Congressional Office of Technology Assessment, testified that this works out to \$72,000 per ton of emission reductions.

Question 4

The Administration's proposal allows the auto manufacturers and oil industry to substitute alternative controls for time-tested controls such as tailpipe standards. This is puzzling because we need all the controls possible. It seems to me that, if new methods of controls are developed, we will need these methods in addition to the older ones.

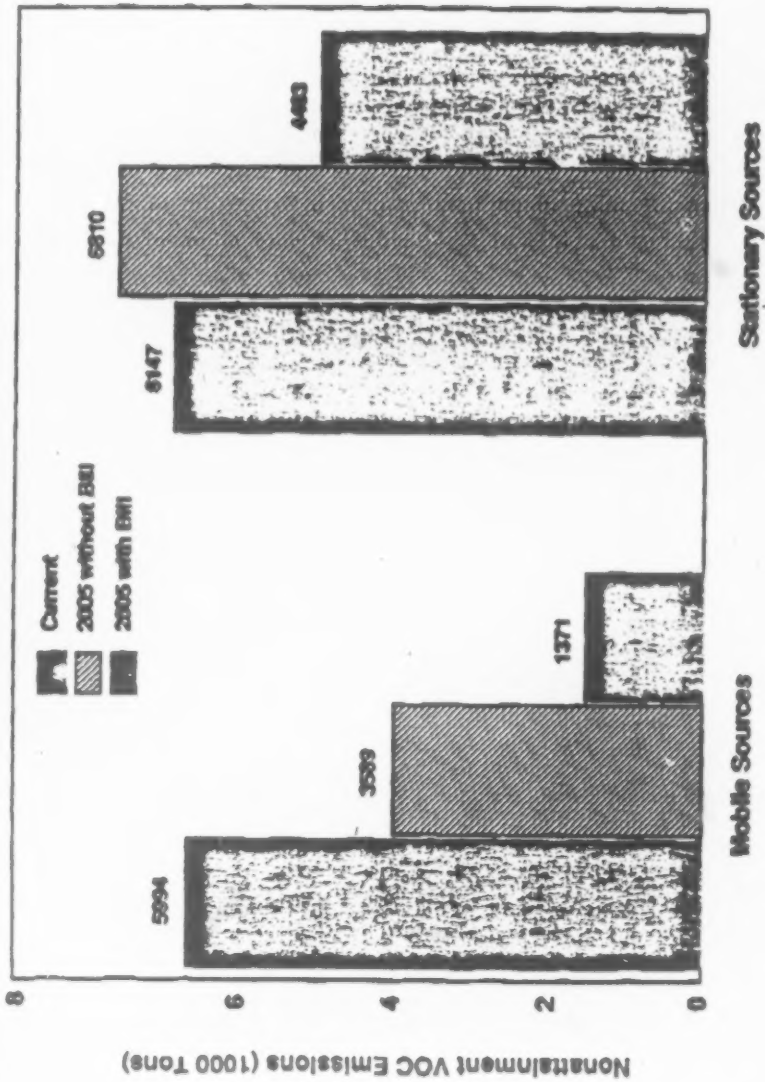
Ans. The purpose of the Administration's proposal to allow alternative controls instead of ever-tighter exhaust emission standards is to allow additional emission reductions to be made in the most cost-effective manner. It is generally recognized that further reductions from today's exhaust emissions standards are a relatively costly way of achieving air quality improvements. (see e.g. "Catching Our Breath: Next Steps for Reducing Urban Ozone," U.S. Congressional Office of Technology Assessment, July 1989, p. 144). This is because as control levels approach 100%, each incremental improvement comes at a sharply increasing cost. Exhaust emissions of hydrocarbons have already been reduced by 96%; the Administration proposal would result in almost 98% control. At that point, further reductions would become extremely expensive, with costs that far exceed any environmental benefit. The Environmental Protection Agency has estimated the incremental cost of standards similar to those contained in the second phase of S. 1630 at \$500 per vehicle. The per ton

cost of this incremental reduction would be about \$72,000, or about 14 times the average cost of the mobile control requirements contained in the Administration proposal.

These extreme "second tier" standards are certainly not "time-tested" and they are not technologically feasible. The cost of achieving these standards, if indeed they could be achieved at all, is so clearly exorbitant and so far in excess of the per-ton costs of other potential control measures that it makes no sense, from either an economic or an environmental perspective, to pursue the second phase standards of S. 1630. In fact, if ever-tighter exhaust emission standards do prove to be technologically infeasible, the substitute controls allowed by the Administration proposal may be the only way to actually achieve further air quality gains.

IGR/CDH
11/1/89

The Proposal Has a Major Impact on VOC Emissions



Testimony of Donald R. Buist
Director, Automotive Emissions and Fuel Economy Office
Ford Motor Company
Before the Senate Environment and Public Works Committee
Environmental Protection Subcommittee
September 28, 1989

Mr. Chairman, Ford supports measures that will have a positive effect on the environment -- we're part of the problem and we want to be part of the solution. We have worked with members of this Committee and staff to reach consensus on a new and workable automotive emissions control program and hope that these discussions can continue.

Clean air is an objective that everyone shares. Of course, the greatest contribution to lowering vehicle emissions will result as new vehicles with sophisticated emissions control systems replace older cars and trucks now in service. Even taking into account increases in the number of miles Americans will drive, we expect average hydrocarbon (HC) emissions to decrease by 38 percent in urban areas by the year 2000.

Nevertheless, we recognize that smog continues to be a major problem in some areas of the country and are willing to do more to further reduce vehicle emissions.

We believe that the President's proposal, S.1490, focuses on implementing the strategies that have the most potential for public value and, for that reason, we support its major objectives. For example, it would require controls on vehicle evaporative emissions and running losses -- the evaporation of fuel when the car is parked or running. A combination of reduced gasoline volatility and improved vehicle evaporative emission controls, along with other fuel system modifications, can reduce ambient hydrocarbons by 25 percent. EPA's new rules requiring lower gasoline volatility has already accounted for about half of this amount.

We also support further reductions in automotive exhaust emission standards. It is important that new standards be technically achievable, focus on nonmethane hydrocarbons because these are the only ones that contribute to

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smog, recognize the factors affecting emissions performance in-use and provide sufficient leadtime and phase-in.

The standards in S.1490 will require the elimination of more than 97 percent of the hydrocarbons once emitted by passenger cars. Further tailpipe controls -- even if technically achievable -- would result in very small incremental air quality benefits. To achieve further reductions in overall motor vehicle emissions will require approaches other than tailpipe controls.

In this regard, we strongly support the President's proposed alternative fuels program. It is a program that recognizes vehicles and the fuels they use as a "system." This "systems" approach opens up new opportunities for air quality improvement, and a number of alternative fuels appear promising as compared with gasoline.

For many years, Ford has been a leader in the development of vehicles that run on alternative fuels. The most promising technology today is our flexible fuel vehicle -- which can operate on ethanol, methanol, gasoline or any combination of these fuels. We believe that this vehicle is the perfect fit for the President's program. Even though there are still open issues regarding alternative fuels, the progress we have made gives us confidence that these can be resolved in time to meet the program's proposed schedule. The next step is for state and federal governments and the oil and auto industries to work together to resolve implementation issues, thus ensuring a worthwhile and successful air quality improvement program.

Nevertheless, there are certain provisions of S.1490 that cause us concern. The proposed truck standards do not fully account for factors that make truck emissions more difficult to control than car emissions. Also, the bill requires manufacturers to "sell" a fixed, large number of alternative fuels vehicles in designated locations even though customer acceptance of the products is presently uncertain. While we can assure production capability and capacity to produce a fixed number of vehicles, it is unfair -- and

-3-

unprecedented -- to require manufacturers to guarantee sales of any product. At a minimum, EPA should require that State Implementation Plans also include incentives adequate to help assure the requisite sales volumes of alternative fuels vehicles.

Although the President's proposal will put a severe strain on our human and technological resources, we intend to do everything we can to be supportive of these initiatives. However, the automotive requirements of S.1630 go beyond what is technologically feasible and would yield very minor benefits as compared with S.1490.

1993 Passenger Car Requirements

We support the proposed 0.25 gpm nonmethane hydrocarbon standard for passenger cars, which appropriately applies only to nonmethane hydrocarbons and is the same as proposed in S.1490. This level represents the maximum feasible reduction while still providing consumers with an acceptable level of function and performance.

However, the 0.4 gpm NO_x standard -- while appropriate for California -- is not a good air quality strategy for the nation as a whole. The Office of Technology Assessment (OTA) found that NO_x reduction can actually be counterproductive in combatting ozone formation when the atmosphere contains a comparatively low ratio of hydrocarbon to NO_x gases. Many urban areas, including Baltimore, Washington, Chicago, Philadelphia, Cincinnati, the Connecticut River Basin, Cleveland, St. Louis and Kansas City have this type of atmospheric condition.

The proposed 1993 standards in S.1630 include no phase-in. A phase-in is necessary for a manufacturer -- especially a full-line manufacturer like Ford -- to refine its designs and processes before incorporating them into full-scale production, and to field test and factor consumer reaction in the development process.

Moreover, S.1630 would require manufacturers to meet the same standards

for both certification and in-use for 10 years or 100,000 miles. This requirement fails to take into account the many factors over which we have no control but that affect compliance in-use. These include vehicle maintenance, operating conditions and fuel and oil quality. The 10 year/100,000 miles requirement would effectively double the stringency of the standard to which manufacturers must design. These standards are even more stringent than those adopted by California, which is dealing with the nation's worst air quality problem. In recognition of the difficulty of meeting its new standards, California set a three-year phase-in schedule, adopted less stringent emissions standards for determining in-use compliance and limited the responsibility for in-use compliance to 75,000 miles for HC and CO and 50,000 miles for NO_x.

S.1630 would revise substantially the procedures used for vehicle certification and testing by adding a new idle test and setting a higher pass rate for vehicles tested under EPA's Selective Enforcement Audits. These changes would result in increased testing burdens for manufacturers and would make it more difficult to meet emissions requirements.

S.1630 also would require onboard refueling vapor control systems on all cars beginning in 1993, and Stage II controls on gasoline pumps in serious ozone nonattainment areas. These requirements are redundant and there is only a maximum one percent ambient hydrocarbon reduction to be achieved by controlling refueling vapors. Moreover, onboard systems would entail nationwide costs, and NHTSA and other safety organizations have raised concerns about the safety of these systems.

Truck Requirements

The proposed light truck standards in S.1630 would require more than a 60 percent reduction in hydrocarbon emissions for trucks under 3750 pounds loaded vehicle weight (LVW) and more than a 50 percent reduction for other light trucks. Similar percentage reductions are required for CO and NO_x. In fact, the light truck standards are more difficult to meet than the proposed car

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standards because trucks must be designed to meet unique functional requirements, such as hauling heavy loads or plowing snow. For example, heavy load operation tends to make the engine run hotter and raises exhaust gas temperature. Because high temperatures accelerate catalyst deterioration, truck catalysts are generally located further from the engine. The result is higher cold start emissions because it takes longer for the catalyst to reach optimum operating temperature. Trucks also must meet more stringent useful life requirements -- 11 years or 120,000 miles.

2003 Passenger Car Requirements

The proposed "second tier" emissions standards in S.1630 are technically infeasible and, even if they could be met, EPA has indicated that these standards would have little effect on improving the nation's air quality. The standards in S.1630 in combination with the proposed 100,000 mile useful life requirement represent about an 80 percent increase in stringency versus today's standards. Even though 2003 seems far in the future, there is no promising breakthrough technology on the horizon.

In our talks with Committee members and staff, there appeared to be wide recognition that these requirements are not achievable with existing or anticipated technology. But the bill's sponsors seem to believe that it is important to set standards that are beyond the ability of manufacturers. It would be far better to set realistic standards, and allow manufacturers to devote their resources to meeting those standards as efficiently as possible. Otherwise, the likelihood is that the industry will have to return to Congress to seek revisions in the requirements.

It is also important to view these proposals in the context of the air quality benefits that can be achieved. Because passenger car hydrocarbon emissions already have been reduced 96 percent from pre-controlled levels, the proposed 0.125 gpm standard would result in very little improvement. A well-reasoned alternative-fuels program is likely to yield far greater air quality

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benefits than the second tier of standards proposed in S.1630 for the year 2003.

Passenger Car Carbon Dioxide (CO₂) Standard

The all-new requirement to control passenger car CO₂ emissions, in effect, would require manufacturers to increase the fuel economy of their passenger car fleets by more than 25 percent by 1995 and by more than 80 percent by 2002. At recent Senate Commerce Committee hearings, Ford testified that fuel economy standards of these levels are far beyond what can reasonably be projected for full-line manufacturers, and if adopted would result in a significant reduction in average vehicle size and utility, which we believe is contrary to the needs and wants of the American consumer.

We also pointed out that higher fuel economy standards would do little to address global warming problems -- which is presumably the intent of this provision. The most important contribution the automotive sector can make to reducing global warming gases is to phase out the use of chlorofluorocarbons (CFCs), and we are doing just that as soon as substitutes are available. CO₂ -- the other major global warming gas -- requires a coordinated international approach. Higher fuel economy standards can contribute only modestly because CO₂ emissions from U.S. vehicles -- cars, trucks and buses -- account for only 2.5 percent of all global warming gases. Even doubling the fuel economy of all cars on the road -- a far more aggressive task than contained in S.1630 -- would reduce the buildup of global warming gases by only about half of one percent. An international carbon fee collected on the production of all carbon-based fuels would be a more equitable and effective approach to reducing CO₂ emissions.

* * * * *

Ford wants to be part of the process that will improve the nation's air quality. We support S.1490 as a constructive approach even though its requirements are very tough and will stretch our resources to the limit. Based

on EPA's projections, all but the most severely impacted cities will be in attainment by 2000 with the national ambient air quality standards for ozone and carbon monoxide if S.1490 is enacted.

S.1630 goes beyond what is feasible in the auto sector, yet would yield very marginal incremental air quality benefits over S.1490. We believe a sound alternative-fuel program has the potential for substantially greater air quality benefits than the second tier of automotive standards proposed in S.1630. We would welcome further opportunities to work with members of this committee to help put together a bill that the industry can support.

STATEMENT OF RONALD R. BOLTZ
Vice President, Product and Operations Planning
Chrysler Motors Corporation
Before the Senate Subcommittee on Environmental Protection
September 28, 1989

Thank you, Mr. Chairman, for the opportunity to express Chrysler's views concerning proposed revisions to the Clean Air Act of 1970 and related amendments.

Chrysler strongly supports the goals of the Clean Air Act, and is proud of its accomplishments in emissions control technology. As you know, exhaust emission standards presently in effect reduce hydrocarbon and carbon monoxide emissions by 96%, compared to pre-control cars of the 1960's. Nonetheless, air quality goals have not been met in many regions of the United States, and there is a justifiable concern that, unless the Clean Air Act amendments are modified, these goals will not be attained in the future. We agree that further efforts are required, and are ready and willing to shoulder our fair share.

In Chrysler's view, the key issue confronting Congress is finding the most cost effective way to achieve air quality goals. Indeed, the clean air goals must be achieved, but in a manner that results in the least cost to the American public.

The merits of various approaches are presently being debated in Congress. I would like to highlight the cost effectiveness of two proposals being considered by the Subcommittee, S.1490 introduced by Senator Chafee and S.1630 introduced by Senator Baucus.

The chart before you (Attachment 1) compares the relative difficulty of meeting the requirements of S.1490 and S.1630 to current standards for hydrocarbon emissions, projects the air quality benefits to be gained, and the cost to the American public of achieving these benefits.

As indicated, the current standard achieves a 96% reduction in hydrocarbon (HC) emissions, a key ingredient in ozone formation. S.1490 is projected by EPA to result in a HC reduction of 98%, an incremental improvement of 2 percentage points at a cost to the American public of approximately \$1 billion annually.

S.1630 is projected to provide a hydrocarbon reduction of 99%, an incremental improvement of 3 percentage points at a cost to the American public of approximately \$7.5 billion annually. The last one percent of hydrocarbon control provided by S.1630 costs the American public \$6.5 billion annually, nearly seven times the total cost of S.1490.

The cost effectiveness comparison assumes the provisions of both S.1490 and S.1630 are achievable in practice with adequate reliability. In fact, the 0.25 gm/mi HC and 50,000 mile useful life requirements for passenger cars included in S.1490 stretch the limits of technical feasibility. Adequate assurance of our ability to comply with these requirements in a reliable manner remains to be established, hence, the risk of recall associated with S.1490 is dramatically higher than current standards.

The ultimate requirements of S.1630, including 0.125 gm/mi HC, 1.7 gm/mi CO, and 0.2 gm/mi NOx at 100,000 miles useful life cannot be achieved reliably with any technology known to Chrysler, at any price. Therefore, our assessment of risk is judged to be extreme.

Will highway vehicles contribute to the solution in the same proportion they contribute to the problem? Yes, highway vehicles will in fact bear more than their fair share under S.1490. For example, highway vehicles presently contribute 40% of total VOC emissions. S.1490 will reduce this contribution by about 20 percentage points, and fleet turnover will further reduce vehicle contribution by an additional 10 pct. pts. In total, highway vehicle VOC's will be reduced by 75%, to a level equivalent to 10% of VOC inventory by the year 2020.

In summary, Chrysler believes that S.1490 achieves the best balance between the need for further emissions reductions, cost-effectiveness and reliable control technology.

Our detailed comments and a comparison of S.1490 and S.1630, including important lead time, technology-forcing and phase-in considerations, will be summarized in our formal submission to be forwarded shortly. At this time, however, I would like to highlight one unique element of S.1630, the provision establishing passenger car CO₂ standards for 1995 and 2003.

A passenger car CO₂ standard was added to address potential global warming issues. These issues are indeed "global", and their full implications are not well understood. U.S. highway vehicles, both passenger cars and light duty trucks, contribute 10% of U.S. CO₂ emissions from fossil fuels, or about 10% of the total U.S. greenhouse gases from all sources. The U.S. share of world greenhouse gases is 21%. Therefore, U.S. highway vehicle CO₂ contribution to worldwide greenhouse gases is 2.1% (10% x 21%). Because the proposed standard is applied only to passenger cars, S.1630 addresses less than 2% of greenhouse gases. The bill's contribution to the solution will be virtually nil. But, at potentially great cost to the American public.

The CO₂ levels specified in S.1630 imply a fuel economy increase for Chrysler of 53% by 1995 and 119% by 2003; or, about 12 mpg improvement for 1995, and 27 mpg by 2003. Fuel economy and vehicle weight are highly correlated (Attachment 2). Improvements of this magnitude will require substantial reduction of vehicle weight, leading to further downsizing of the fleet, perhaps to a degree that will be unacceptable to a broad cross-section of the American public.

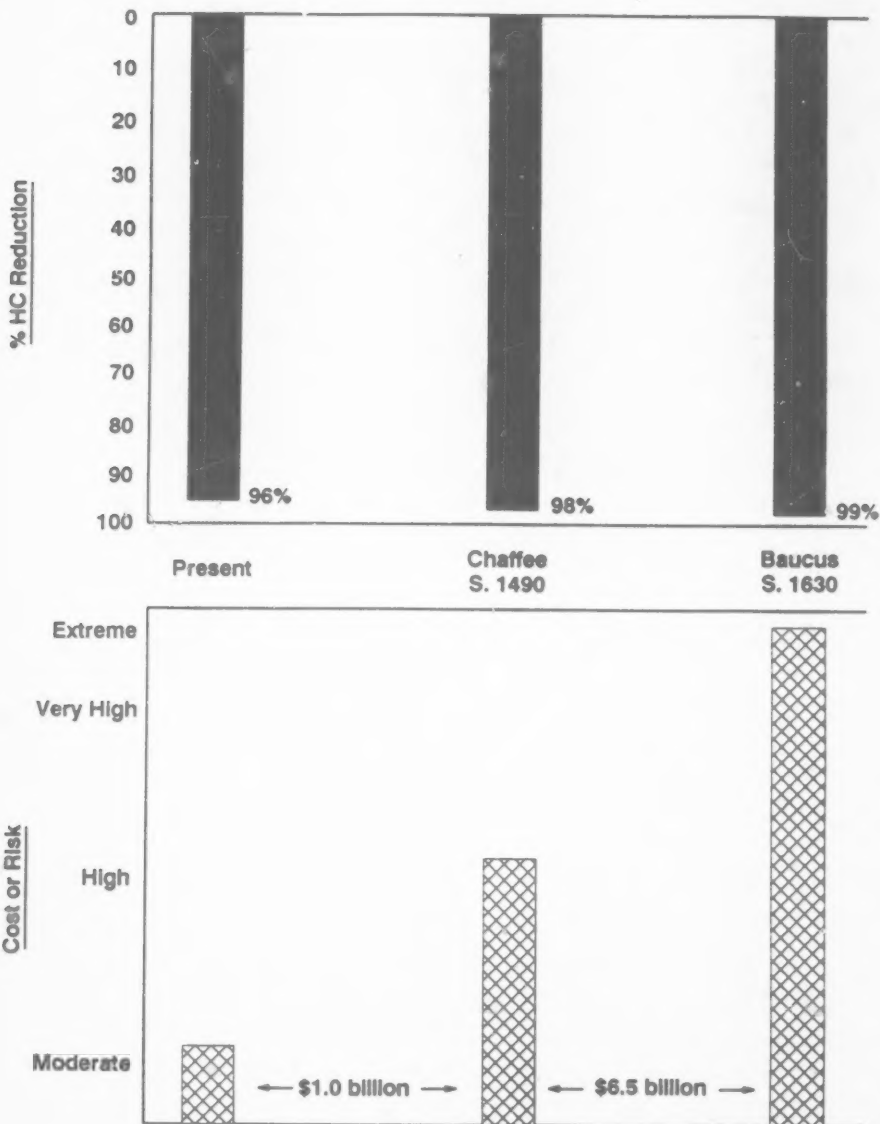
A legislated CO₂ standard for passenger cars is at best an indirect and incomplete method of imposing a fuel conservation program on the American public, and will have minimal impact on global warming trends. A more direct and fruitful approach would be to impose a carbon fee on all fuels containing the carbon atom, bringing market forces to bear on all controllable CO₂ sources, not merely the passenger car sector of the economy.

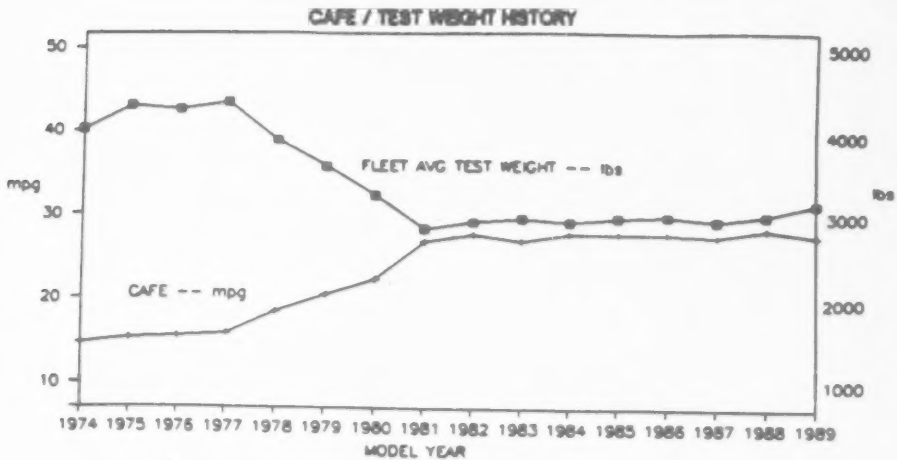
I would like to suggest to the Subcommittee that global warming issues require, and deserve, considerable study before an appropriate and effective policy can be fashioned. Inclusion of these issues with other clean air imperatives will impede actions required to achieve National air quality goals. To permit a timely resolution of the Clean Air Act amendments, global warming issues should be addressed separately. In addition, there is a legislative foundation and administrative process presently in place, addressing corporate average fuel economy standards, that will conflict with proposed CO₂ requirements.

In closing, Chrysler believes the provisions of S.1490, though far from perfect, will provide the proper balance between the need for cost-effective emissions improvements and reliable control technology. The CO₂ provisions of S.1630, in any event, should be abandoned.

Thank you for your attention.

PERCENT REDUCTION OF HYDROCARBON EMISSIONS
vs.
COST or RISK OF FAILURE TO CERTIFY or RISK OF RECALL



CHRYSLER MOTORS DOMESTIC FLEETCHRYSLER MOTORS CAFE / WEIGHT

MODEL YEAR	FLEET AVG TEST WEIGHT	DOMESTIC CAFE
	lbs	mpg
1974	4022	14.7
1975	4304	15.3
1976	4262	15.5
1977	4344	15.9
1978	3891	18.4
1979	3576	20.5
1980	3230	22.3
1981	2833	26.8
1982	2912	27.6
1983	2960	26.9
1984	2916	27.6
1985	2974	27.6
1986	2968	27.6
1987	2939	27.5
1988	3008	28.4
1989	3150	27.7

DOWNSIZING
 +
 TECHNOLOGY

TECHNOLOGY
 DEVELOPMENT

CORRELATION

97%

Statement of
Michael P. Walsh

Before The
US Senate Environment and Public Works Committee

September 28, 1989

I. INTRODUCTION

Good morning, Mr. Chairman and members of the Committee. My name is Michael P. Walsh and I am an independent technical consultant in the motor vehicle air pollution control field. My clients have included many government agencies, international bodies such as the World Health Organization, the United Nations Environment Program (UNEP), the United Nations Industrial Development Organization (UNIDO), and the World Bank as well as private companies engaged in the manufacture of pollution control equipment. I have advised and carried out studies regarding motor vehicle pollution control issues for numerous countries including Sweden, Germany, Switzerland, The Netherlands, Austria, Denmark, Norway, Taiwan, the People's Republic of China, South Korea and Hong Kong. I am an advisor to the 10 Club, a group of primarily European countries, committed to substantial reductions in motor vehicle emissions and am presently assessing a variety of vehicle pollution control strategies in Europe for the Environment Division of the Organization For Economic Cooperation and Development in Paris. Just this past weekend, I have returned from a United Nations Conference assisting developing Countries in addressing their transport related environmental and energy problems and will travel to Asia next week on a related mission.

Within the US, I have assisted the Denver Metropolitan Air Quality Council in designing steps to address its diesel particulate problem and recently completed studies of the impact of transportation on global warming for the World Resources Institute and the Congressional Office of Technology Assessment. Also, I have been a consultant to this Committee and completed a study, "Pollution On Wheels" for the American Lung Association as well as a comprehensive evaluation of the Federal Motor Vehicle Pollution Control Program for NESCAUM, an association of Northeast states. I have also assisted both these groups in their assessment of the California vehicle control program.

From 1974 to 1981 I was employed by the US Environmental Protection Agency; during the last three of those years, I was the Director of the Office of Mobile Source Air Pollution Control. During my watch, the Office devoted

major efforts to expanding the number of I/M programs around the country, and adopted the first diesel particulate standard in the world. New vehicle certification was substantially streamlined. In addition comprehensive truck regulations were adopted. Also during this time the current auto standards - 0.41 grams per mile HC, 3.4 CO and 1.0 NOx - went into effect.

I am presenting this statement as a private citizen, not as a representative of any government agency or company.

II. THE NEED FOR CONTROL

The health and environmental need for more stringent vehicle pollution controls can no longer be debated. Air quality levels during the last few years show that growth and other factors are overtaking many of the technological gains of the 1970's and early 1980's. In 1988, photochemical smog was worse than at any time this decade. As illustrated in Table 1, during 1988, according to EPA, over 100 areas of the country exceeded healthy levels for ozone. For carbon monoxide, 44 areas exceeded healthy levels as listed in Table 2. Table 3 shows that while there was a slight decline in the unhealthy CO areas, the ozone problem was much worse. According to EPA estimates, over 130 million Americans live in these unhealthy areas, more than half the country. Further, it is increasingly clear that the same pollutants which cause local and regional problems contribute significantly to the global concern over climate modification. Vehicle emissions of HC, NOx and CO, as well as CO₂ and CFC's are dominant contributors to the global concern with climate modification.

III. THE IMPORTANCE OF TRANSPORTATION

It is clear that to achieve the air quality objectives which we laid out for the country and which we know are necessary to protect public health and the environment will require substantial additional control of emissions. As the single largest source of nitrogen oxides, hydrocarbons and carbon monoxide emissions, motor vehicles must be a major focus of additional control. During 1987, transportation sources were responsible for 40 percent of nationwide lead emissions, 70 percent of the CO, 31 percent of the volatile organic compounds (HC), (almost 50 percent if running losses are included) 45 percent of the NOx, and 18 percent of the particulate. In most cities, the mobile source contribution is even higher (OTA, for example, estimates that mobile sources were responsible for 48% of the VOC's in non attainment cities in 1985.) Compared to other individual source categories, Figure 2 shows that transportation is clearly dominant.

As illustrated in Figure 3, vehicle travel in the US is

Table 1. Areas Experiencing Unhealthy Ozone Levels Based on 1986-88 Air Quality Data

EPA Region	Metropolitan Area (CMSA/MSA) (Note 1)	1986-88		1988	
		Design Value (Note 2)	Avg. Est. Exc. (Note 3)	2nd Max 1-H	Est. Exc.
I	Boston CMSA	0.165 +	10	0.169	11.4
I	* Hancock Co, ME (Acadia Nat Park) (	0.153	12	0.153	12
I	Hartford CMSA	0.179	6.9	0.185	10
I	* Knox Co, ME	0.158	8.1	0.158	15.6
I	* Lincoln Co, ME (Note 5)	0.127	2.4	ND	ND
I	Lewiston-Auburn, ME (Note 6)	0.137 +	1.5	0.121	1.5
I	Manchester, NH	0.136 ++	2.4	0.143	11.2
I	Portland, ME (Note 7)	0.156	5.4	0.168	11.2
I	Portsmouth-Dover-Roch., NH-ME (	0.179 ++	7.8	0.179	11.1
I	Providence CMSA	0.162	6.6	0.168	8.5
I	Springfield, MA	0.162 +	7.3	0.167	13.4
I	* Waldo CO, ME (Note 9)	0.120	1	ND	ND
I	Worcester, MA	0.167	7.3	0.176	17.1
II	** Albany-Schenectady-Troy, NY	0.126	4	0.126	4
II	Atlantic City, NJ	0.143	3.7	0.145	6
II	Buffalo CMSA	0.131	3.4	0.152	8.3
II	* Essex CO, NY (Whiteface Mtn)	0.127	1.8	0.133	5.4
II	* Jefferson CO, NY	0.143	5.1	0.143	6.1
II	New York CMSA (Note 10)	0.216 +	18	0.217	18
II	Poughkeepsie, NY	0.138	1.7	0.140	4
III	Allentown-Bethlehem, PA-NJ	0.137	3.1	0.163	10.1
III	Altoona, PA	0.129	2	0.136	4
III	Baltimore, MD	0.181	13.3	0.194	19.3
III	Charleston, WV	0.138	2.7	0.157	7
III	Erie, PA (Note 11)	0.129	2.4	0.148	6.1
III	* Greenbrier CO, WV	0.125	1.4	0.132	4.1
III	Harrisburg-Lebanon-Carlisle, PA	0.136	2.2	0.139	6.9
III	Huntington-Ashland, WV-KY-OH	0.165	6.2	0.169	10.4
III	Johnstown, PA	0.133	2.5	0.144	7.4
III	Lancaster, PA	0.125	1.3	0.127	3
III	Norfolk-VA Beach-Newport News,	0.133 ++	3	0.133	4
III	Parkersburg-Marietta, WV-OH	0.169	7.2	0.169	17
III	Philadelphia CMSA	0.180	8.9	0.2	18.2
III	Pittsburgh CMSA	0.149	6.6	0.157	14.8
III	Reading, PA	0.141	3.4	0.148	9.2

III	Richmond-Petersburg, VA	0.142	4.4	0.154	9.2	
III	Scranton-Wilkes-Barre, PA	0.129	3	0.146	9.1	
III	* Sussex CO, DE	0.130	3.6	0.150	9.9	
III	Washington, DC-MD-VA	0.163	8.3	0.179	13.8	
III	York, PA	0.129	1.5	0.142	4.6	
IV	Anderson, SC (Clemson, SC)	0.127	+	3.1	0.127	3.1
IV	Atlanta, GA	0.166	++	10.2	0.170	13.2
IV	*** Birmingham, AL	0.143	3.7	0.145	2	
IV	Charlotte-Gastonia-Rock Hill, NC	0.149	5.7	0.158	7.1	
IV	Columbia, SC	0.125	++	1.6	0.128	2.1
IV	* Edmonson CO, KY (Bowling Green)	0.140	2.1	0.140	5.1	
IV	Fayetteville, NC	0.125	1.4	0.131	3.1	
IV	Greensboro-Winston Salem-High P	0.151	+	7.2	0.151	7.2
IV	Greenville-Spartanburg, SC	0.138	+	4.8	0.138	4.8
IV	Huntsville, AL	0.122	1.1	0.127	2.1	
IV	Jacksonville, FL	0.120	1.1	0.115	1.1	
IV	Knoxville, TN	0.135	1.8	0.140	5.4	
IV	* Livingston, CO, KY (Paducah)	0.129	1.8	0.132	3.3	
IV	Lexington-Fayette, KY	0.128	2.7	0.130	5	
IV	Louisville, KY-IN	0.171	5.6	0.183	4.5	
IV	Memphis, TN-AR-MS	0.146	2.7	0.148	4.1	
IV	Miami CMSA	0.143	2.4	0.147	3	
IV	Montgomery, AL	0.135	1.8	0.109	1.1	
IV	Nashville, TN	0.139	6	0.138	11.7	
IV	Owensboro, KY (adj. Hancock CO)	0.137	4.1	0.150	10.2	
IV	Raleigh-Durham, NC	0.141	4.4	0.157	10.2	
IV	Tampa-St. Petersburg-Clearwater,	0.129	1.7	0.117	0	
V	Canton, OH	0.135	1.7	0.152	5.2	
V	Chicago CMSA	0.193	+	21.2	0.215	16.2
V	Cincinnati CMSA	0.157	5.4	0.169	14.1	
V	Cleveland CMSA	0.145	5.8	0.167	13.3	
V	Columbus, OH	0.134	1.4	0.148	4	
V	Dayton-Springfield, OH	0.136	2.7	0.143	6.2	
V	Detroit CMSA	0.144	3.3	0.147	4.1	
V	Grand Rapids, MI	0.143	3.1	0.145	7	
V	Indianapolis, IN	0.124	++	1.1	0.137	2.1
V	* Kewaunee CO, WI	0.147	5.5	0.152	10.6	
V	Lafayette-West Lafayette, IN	0.126	+	2.1	0.126	2.1
V	Milwaukee CMSA	0.183	9.1	0.188	14.2	
V	Muskegon, MI	0.180	++	9	0.153	12.1
V	Sheboygan, WI (Note 12)	0.167	9.5	0.167	15.5	
V	South Bend-Mishawaka, IN	0.121	1.1	0.135	3.2	
V	Toledo, OH	0.136	2.4	0.155	6.2	
V	Youngstown, OH-PA (Inc. Sharon,	0.134	2.5	0.143	5.4	
VI	Baton Rouge, LA	0.164	4.1	0.164	6.3	

VI.	Beaumont-Port Arthur, TX	0.160	4.5	0.160	6.8
VI	Dallas CMSA (Note 13)	0.140	5.8	0.140	4.3
VI	El Paso, TX	0.170	8.1	0.170	5.4
VI	Houston CMSA (Note 14)	0.190	12.6	0.220	8.3
VI	Lake Charles, LA	0.132	2	0.131	3
VI	Tulsa, OK	0.124	1.1	0.118	1
VII	Kansas City, MO-KS	0.130	1.7	0.153	3
VII	St. Louis, MO-IL	0.159	7.5	0.153	7.3
VIII	Salt Lake City-Ogden, UT	0.143	3.1	0.143	2.2
IX	** Bakersfield, CA	0.160	37.8	0.170	54
IX	Fresno, CA	0.170	31.6	0.160	30.3
IX	** Los Angeles CMSA	0.340	145.	0.330	148
IX	** Modesto, CA	0.140	6	0.130	4
IX	Phoenix, AZ	0.140	1.4	0.120	1.1
IX	Sacramento, CA	0.160	8.9	0.170	15.5
IX	San Diego, CA	0.180	11.1	0.190	7.1
IX	** San Francisco CMSA	0.140	3.4	0.140	4.1
IX	** Santa Barbara-Santa Maria-LOMP	0.130	1.7	0.108	0
IX	** Stockton, CA	0.130	2.3	0.140	2
IX	** Visalia-Tulare-Porterville, CA	0.150	8.5	0.130	4
X	Portland CMSA	0.145	1.8	0.127	2.4

Source: Aerometric Information Retrieval System (AIRS), status as of July 7, 1989 with supplemental data from Regional Office review. (See Note 15.)

Notes:

* - Indicates area is not a Metropolitan Statistical Area.

** - Indicates incomplete, or missing, 1988 data in AIRS. Additional data provided by State and local agencies.

+ - Indicates design value is based on data from a new site which started monitoring in 1988.

++ - Indicates design value is based on data from a site with only two years of data, 1987 and 1988.

1. Metropolitan Statistical Areas are defined by the Office of Management and Budget, and include a central county and adjacent counties, if any, which interact with the urban area.

2. The air quality design value is estimated using the table lookup procedure recommended for ozone SIPs. That is the fourth highest monitored value with 3 complete years of data is selected as the design value since the standard allow

MPW 9/10/89

one exceedance for each year. This value may differ from actual SIP control strategy value due to air quality modeling considerations such as the level of transported ozone. It may also differ from other estimation procedures, such as fitting a tail-exponential distribution, particularly in the case of incomplete, or missing data.

3. The National Ambient Air Quality standard for ozone is 0.12 parts per million (ppm) daily maximum 1-hour average not to be exceeded more than once per year on average. The average estimated number of exceedances column shows the number of days the 0.12 ppm standard was exceeded on average at the site recording the highest design value after adjustment of incomplete, or missing days, during the 3-year period, 1986-88. The highest second maximum 1-hour concentration in 1988, and the associated estimated exceedances, are shown in the last two columns.

4. Data provided by National Park Service not yet available in AIRS.

5. Rural Maine County is presumed nonattainment based on data from prior years and its location between existing nonattainment areas.

6. Planning area includes all of Androscoggin County, ME. Adjacent Kennebec County is grouped with this area.

7. Planning area includes all of Cumberland County, ME. Adjacent Sagadahoc County is grouped with this area.

8. Planning area includes all of York County, ME.

9. Rural Maine county which is between existing nonattainment counties and is presumed nonattainment.

10. The site on the roof of the World Trade Center was established to measure upper level ozone concentrations for long-range transport research. It is not representative of New York City ambient air and was not used to estimate the design value for New York.

11. The site was relocated within two blocks of the previous location in 1988 and the data from both locations were combined in calculating the design value and estimated exceedances.

12. The site in Manitowoc, WI was selected as the design value site for Sheboygan.

13. The monitoring site in Dallas which was discontinued in 1986 was not used to estimate the design value for this area.

14. The monitoring site in Houston which was discontinued in 1986 was not used to estimate the design value for this area.

15. Anomalous data in AIRS, identified during the Regional review, were omitted for sites in Las Vegas, NV; Carson City, NV; Reno, NV and Steubenville, OH. These data errors will be corrected in AIRS.

Table 2. Areas with Unhealthy Carbon Monoxide Air Quality
Based on 1987 and 1988 Ambient Data

EPA Region	Metropolitan Area (CMSA/MSA)	1987-88 Design Value	Year	1988	
				2nd Max 1-HR	# Exc.
I	Boston, MA CMSA	9.8	1986	6.5	0
I	Hartford, CT CMSA	11.4	1987	10.2	3
I	Manchester, NH	10.3	1987	8.7	1
II	New York, NY-NJ-CT CMSA	19.6	1987	13.5	26
III	Baltimore, MD	9.5	1988	9.5	2
III	Washington, DC-MD-VA	11.4	1987	8.1	1
IV	Greensboro-Winston Salem-High P	9.7	1988	9.7	2
IV	Memphis, TN-AR-MS	10.5	1987	7.3	0
V	Raleigh-Durham, NC	10.0	1988	10.0	2
V	** Cleveland, OH CMSA	10.1	1986	7.0	0
V	Minneapolis-St. Paul, MN-WI	4.3	1987	10.7	8
V	Steubenville-Weirton, OH-WV	30.3	1987	19.6	31
V	Winnebago CO, WI (Oshkosh, WI)	19.9	1988	19.9	32
VI	Albuquerque, NM	16.3	1987	11.1	5
VI	El Paso, TX	15.4	1987	11.4	3
VI	Oklahoma City, OK	11.4	1987	6.7	0
VII	St. Louis, MO-IL	10.5	1987	8.2	0
VIII	Colorado Springs, CO	11.8	1988	11.8	2
VIII	Denver-Boulder, CO CMSA	16.2	1988	16.2	10
VIII	Fort Collins, CO	12.8	1987	11.3	3
VIII	Great Falls, MT	11.0	1987	9.2	1
VIII	Greeley, CO	10.5	1987	9.2	1
VIII	* Missoula CO, MT	10.6	1987	9.6	2
VIII	Provo-Orem, UT	13.3	1987	11.0	5
VIII	Salt Lake City-Ogden, UT	9.8	1987	8.0	0
IX	Chico, CA	10.4	1988	10.4	2
IX	Fresno, CA	13.0	1988	13.3	3
IX	Las Vegas, NV	14.4	1988	14.4	26
IX	Los Angeles, CA CMSA	19.6	1988	19.6	51
IX	Modesto, CA	9.7	1988	9.7	2
IX	Phoenix, AZ	15.5	1986	12.0	11
IX	Reno, NV	9.9	1988	9.9	3
IX	Sacramento, CA	12.5	1987	11.1	6
IX	San Diego, CA	9.5	1988	9.5	2
IX	San Francisco-Oakland-San Jose,	10.3	1988	10.3	2
X	Anchorage, AK	11.8	1988	11.8	4
X	* Fairbanks North Star Borough, AK	13.9	1987	13.2	9
X	* Josephine CO, OR (Grants Pass)	10.3	1988	10.3	2
X	* Klamath CO, OR (Klamath Falls)	10.5	1988	10.5	3
X	Medford, OR	11.3	1988	11.3	3

Table 3. Differences from the 1985-87
Ozone and Carbon Monoxide Lists
Ozone - 101 Areas

37 new areas exceeding Healthy Ozone Levels, 1986-88

I	Waldo CO, ME	
I	Le IV	Columbia, SC
I	M IV	Edmonson CO, KY
II	Al IV	Fayetteville, NY
II	B IV	Greensboro-High Point, NC
II	E IV	Greenville-Spartanburg, SC
II	P IV	Huntsville, AL
III	Al IV	Knoxville, TN
III	C IV	Livingston CO, KY
III	Er IV	Owensboro, KY
III	Gr V	Canton, OH
III	H V	Columbus, OH
III	La V	Lafayette-W. Lafayette, IN
III	R V	South Bend-Mishawaka, IN
III	S V	Toledo, OH
III	S V	Youngstown, OH (Inc. Sharon, PA)
III	Y VI	Lake Charles, LA
IV	A VII	Kansas City, MO-KS

(Two previously listed rural Maine counties, Kennebec and Sagadahoc, were grouped with adjacent nonattainment metropolitan areas.)

Carbon Monoxide - 44 Areas

- 12 areas deleted based on 1987-88 carbon monoxide data

I	S VI	Houston, TX
II	S VII	Lincoln, NE
III	Pi VII	Springfield, MO
IV	N VII	Wichita, KS
V	D X	Boise City, ID
V	Duluth, MN	
V	St. Cloud, MN	

- 4 areas added based on 1988 carbon monoxide data

IV	Gr IX	Klamath CO, OR
V	W IX	San Diego, CA

* Federal Register, June 6, 1988

increasing by about 25 billion additional miles per year. This growth coupled with poor emissions control during the second half of an automobile's life and less stringent controls on other mobile sources are offsetting the overall gains from the automobile standards adopted to date. Without additional controls on vehicles, overall emissions will start to increase over the next ten to 15 years. OTA and EPA projections indicate similar trends.

The speed with which future increases in vehicle emissions will occur and the steepness of the increase depends in large part on future growth rates in vehicle miles travelled as illustrated in Figures 4, 5 and 6 for NO_x, HC and CO. Since VMT growth is currently increasing more rapidly than over the past few years, greater vehicle control per mile driven will be needed to offset these increases. Very recently, the head of the Highway Users Federation indicated that the growth rate in many urban areas is currently about 6% per year and overall mileage could double between now and the year 2000.

IV. POTENTIAL AUTO EMISSION CONTROL STRATEGIES

Assuming a conservative growth rate of only 3 percent per year, Figures 7, 8, and 9 illustrate the potential emission reduction benefits which could occur in the future from a variety of alternative strategies which have been suggested.

A. Oxides of Nitrogen

Tightening the standard from the current 1.0 gram per mile to 0.4 (the current California standard) by 1993 and requiring the standard to be met for 100,000 miles starting in the 1995 Model Year, will reduce emissions by about 35%. Enhanced I/M will add another 10% reduction and adoption of the so called Stage 2 standard, 0.2 grams per mile, by the year 2000 would add another 10%, thereby increasing the overall reduction to 55%.

B. Hydrocarbons

Not surprisingly, adoption of onboard HC refueling controls (OBD) and 9.0 RVP gasoline would help substantially; adoption of 9.0 lb. RVP would lower HC from cars by 23% and onboard refueling HC controls by another 10 percent. Tightening the standard from the current 0.41 gram per mile to 0.25 by 1993 and requiring the standard to be met for 100,000 miles starting in the 1995 Model Year, will reduce emissions by about the same as onboard, 10%. Enhanced I/M will add another 10% reduction and adoption of the so called Stage 2 standard, 0.125 grams per mile, by the year 2000, will increase the reduction by another 5% for a total of 58%.

C. Carbon Monoxide

Adoption of 9.0 RVP gasoline would lower CO from cars by 20%. Extending the useful life to 100,000 miles starting in the 1995 Model Year will reduce emissions by another 15%. Enhanced I/M will add another 20% reduction and adoption of the so called Stage 2 standard, 1.7 grams per mile by the year 2000 will increase the reduction to 58%.

V. Conclusions Regarding Emissions From Vehicles

- 1) Without further controls, emissions from cars will bottom out during the next decade and start to increase shortly thereafter; by 2010, auto emissions will be generally as high or higher than at present.
- 2) Even this assessment may understate the seriousness of the problem as it doesn't account for driving under conditions of lower temperatures or higher speeds beyond those encountered during the official EPA test procedure. Further, it doesn't account for the increased congestion which will inevitably occur in many cities as a result of the increased growth in vehicle miles travelled which is occurring.
- 3) Further tightening of exhaust standards, extending the useful life to reflect actual real world lifetimes, less volatile gasoline, onboard hydrocarbon refueling control and enhanced I/M would each bring about significant reductions from the base case which would otherwise occur and implemented together could cut existing auto pollution levels in half.

I would like to discuss several of the specific provisions below.

VI. CARBON DIOXIDE STANDARDS

As explained in the Appendix, control of CO, HC and NOx emissions is critical not only for urban air pollution but also to address global warming. The strategies summarized above will therefore be very beneficial in that regard as will reductions in CFC emissions from vehicles and other sources. However, these alone are far from sufficient to solve the problem; substantial control of CO₂ emissions is also necessary. Last year's Toronto Conference indicated reductions of 20 to 50 percent are needed in the short term; EPA has noted that much greater reductions are likely needed. As a major consumer of fossil fuels, motor vehicles have a major role to play.

A. The Importance Of Motor Vehicles

1. Overall Historical Trends

Figure 10 shows the overall trends in vehicle registrations around the world since 1930. Since 1950, the average annual growth rate for cars has been 5.9 percent; for trucks and buses, it has been only slightly less, 5.6 percent per year. Most recently the trends have remained quite high but commercial vehicles have actually been growing more rapidly than cars. For example, since 1970, annual car growth has averaged 4.7 percent per year while truck and bus registrations averaged 5.1 percent per year. Overall, as a result of this growth, the total worldwide vehicle population in 1985 was 500 million, with cars just slightly under 400 million.

2. The Current Fleet

With regard to the global car population, Figure 11 shows that Europe and North America each have slightly more than a third of the world's population, with the remainder divided between Asia, South America, Oceania and Africa, in that order. With regard to trucks and buses, on the other hand, North America has about 40 percent followed closely by Asia and then Europe (Figure 12).

It is important to emphasize the dominant role of North America as a potential vehicle market. While the percentage growth in vehicle production is quite high in other countries and to a lesser extent the percentage growth in vehicle registrations is also quite high, the "highly industrialized" US market is so large as to dominate the world and is likely to continue to do so for the foreseeable future.

The significance of this is that to a large extent, vehicle characteristics in the US will have a significant impact on vehicle characteristics in other areas. For example, it seems likely that increased stringency of emissions or fuel economy requirements in the United States would lead to similar improvements in other vehicle markets, especially those where vehicle production is increasing with an eye toward export to the highly industrialized markets. The converse is, of course, also true - weak requirements in the highly industrialized areas likely means weak controls in the developing areas.

Beyond new vehicles, it also appears that much of the vehicle population growth in some rapidly industrializing, developing countries comes from imports of used vehicles from highly industrialized areas. In this way also, therefore, fundamental designs which are either high or low

in emissions or fuel consumption are perpetuated and can increase or decrease overall emissions and fuel consumption in these rapidly industrializing countries.

B. Fuel Consumption and CO₂ Emissions

1. The US Fuel Consumption Experience

Figure 13 shows that auto CAFE rose during the 1970's but has remained fairly flat since the early 1980's. It is important to note that during the 1970's when emissions standards were substantially tightened, average miles per gallon improved substantially. (This observation is also true even if fuel economy improvements due to vehicle weight reductions are not included.) However, during the 1980's when vehicle emission standards have generally stabilized, fuel economy gains have been minimal. Further, without the stimulus of regulatory requirements or market incentives due to higher fuel prices, manufacturers quickly reverted to historical patterns of competing on the basis of horsepower and acceleration rather than fuel economy or emissions. The lesson seems to be that, just as with emissions, stringent regulation is the surest path to the desired goal.

On a worldwide basis at present very little if any fuel efficiency improvement is occurring. The governmental push of the late 1970's and early 1980's has stalled and market competition now appears to be focused primarily on performance improvements rather than fuel economy gains. The significance of this for global CO₂ is illustrated in Figure 14. In effect, even with only a 2 percent annual growth worldwide in vehicle miles travelled, motor vehicle CO₂ emissions will skyrocket over the next forty to fifty years. Modest improvements on the scale of 1 percent per year would barely reduce this growth.

Carbon dioxide

CO₂ is a major hothouse gas. A single tank of gasoline produces between 300 and 400 pounds of CO₂ when burned. Overall, the transport sector uses approximately 56 quads of energy each year. As illustrated in Figures 15 and 16, the consumption varies considerably between regions of the world, with the US far and away the largest consumer, using over 35% of the world's transport energy. Transport consumes almost one-third of the total energy consumed in the world, again highly variable by region as illustrated in Figure 17. It is important to note the already significant proportion of energy consumption by transport in many rapidly developing areas of the world.

Because of this high overall energy consumption, it is not surprising that motor vehicles emit over 1100 Tg of carbon

as illustrated in Figure 18, approximately 25 percent of the world's output; in the US, transport is responsible for almost 30 percent of the total CO₂ emissions as shown in Figure 19. As illustrated in Figure 20, the US accounts for more than one third of the global transport budget, emitting almost as much CO₂ from the transport sector as Eastern Europe, Asia, China, Africa, Latin America and the Middle East combined. In fact, as illustrated in Figure 21, the fossil fuel CO₂ emissions in the US from the transport sector alone exceed total fossil fuel CO₂ emissions from all sources in all of Latin America, of Japan, the Middle East, West Germany and many other countries.

Figures 22 and 23 show that the CO₂ requirements in the Committee Bill are necessary to stabilize US auto fuel consumption and CO₂ emissions.

C. The Linkage Between CO₂ and Conventional Pollutants

Experience gained during the 1970's and 1980's in the US suggests that the dual goals of low emissions (CO, HC and NOx) and improved energy efficiency (and therefore lower CO₂) are not only compatible but mutually reinforcing.

In spite of this historical record, one of the arguments being put forth by the vehicle manufacturers is that it would be a mistake to tighten tailpipe standards for conventional pollutants such as CO, HC and NOx, because such standards will lead to increased carbon dioxide and more global warming. The specific focus is with regard to the oxides of nitrogen where it is argued tighter standards would result in a fuel economy penalty and therefore increased CO₂. To investigate this issue, a data set of 1989 model year cars was obtained from EPA. The test car list data includes test measurements of HC, CO, NOx and CO₂ for 891 1989 model cars including nearly all combinations of engine, transmission and test weights for most car models.

This analysis consisted of carrying out a linear regression of the raw, unweighted data, with every test counting equally. The regression equation specified the CO₂ emissions in grams per mile as the dependent variable and NOx, HC or CO emissions in grams per mile as the independent variable.

The resulting regression equations are plotted in Figures 24, 25 and 26.

The equations suggest that contrary to the industry arguments, in fact, carbon dioxide emissions will tend to go down as NOx, HC or CO are reduced. This result tends to

support the observation that more stringent emissions standards tends to encourage the more advanced air fuel and spark management systems with the result that overall fuel economy also tends to improve.

VII. EMISSIONS STANDARDS

The standards contained in the Committee Bill are technologically feasible. Many vehicles already achieve these levels; for most others, either EPA or California have adopted the requirements after finding that they are technologically feasible. In a few cases, while not adopted by either EPA or California, one or the other or both Agencies have found them to be feasible. Specific standards are discussed below:

A. Passenger Cars - LDV

Technology for light duty vehicles has advanced beyond the levels needed to achieve today's Federal standards and we should take advantage of it. For example, cars were introduced in California last year (1989 Model Year) which meet the 0.4 gram per mile standard which S 1630 requires in 1993. Further, Certification data show that the vast majority of cars produced across the country last year have designs which are capable of achieving 0.4 NOx, 0.25 HC and 3.4 CO. Finally, as illustrated in Figure 27, General Motors presented data at this years annual meeting of the Society of Automotive Engineers indicating that their average 1987 model year car is already meeting the standards required by the Committee Bill for HC and CO, in use, for 50,000 miles under normal maintenance. As indicated in the Figure, NOx levels for these cars are well below the 1.0 gram per mile requirement and well on the way to the 0.4 gram per mile requirement contained in the Bill for 1993. GM noted at last year's EPA workshop on cold temperature CO that they are still moving down the learning curve with this technology and expect to see significant additional improvements over the next few years. Improvements in recent years according to GM are the result of reduced oil consumption, which improves catalyst performance since oil additives have tended to impair catalyst durability, more precise electronic control and diagnostics, engine improvements, and improved catalyst coatings. Lower trace lead levels in unleaded gasoline and more advanced emissions control components, particularly more durable catalysts, better air fuel management systems, and electronics should also help. As recently noted by the CARB, "the technology, which manufacturers are expected to utilize for lowering NMHC (non methane hydrocarbons) emissions, includes more durable and efficient close coupled catalytic converters. These single bed converters are located in, or close to, the engine exhaust manifold and "light off" quickly to very effectively lower cold

start HC [and CO] emissions."

In adopting the 0.4 NOx requirement, CARB estimated the cost to be about 25\$ to 30\$ per car. California also recently concluded that 0.25 is feasible and cost effective for HC. Their most recent staff analysis regarding tighter CO and HC standards and an expansion of the useful life estimates that compliance would require expanded fuel injection, platinum tipped spark plugs, dual oxygen sensors, increased catalyst loading, and warm up or bypass catalysts on a portion of a fleet at an average cost of approximately 65\$ per vehicle. To put these numbers in perspective, it is useful to note that according to the Automotive News of April 24, 1989, power windows on a two door Chevrolet costs 220\$.

Manufacturers have argued that California vehicles can achieve very low NOx levels because the California CO standard is 7.0 rather than the federal standard of 3.4. California technical staff has recently concluded that 3.4 CO and 0.4 NOx can be achieved simultaneously. In fact, the data suggests that lower NOx should lead to slightly lower CO. CARB found that 109 out of 120 engine families that had certification levels below 0.4 NOx in California also had CO levels below 3.4 CO.

Some will still argue that the technology to meet these standards is not yet demonstrated, using the logic, it appears, that since all vehicles on the road are not already achieving the required levels, they are not demonstrated. Fortunately, this "logic" did not influence the designers of the 1970 Clean Air Act.

B. The Second Step For Light Duty Vehicles

The Committee proposal also contains a second step, to go into effect in the year 2003. As illustrated in Figures 7, 8 and 9, these standards are necessary to continue the progress downward beyond the year 2000. The issue is this: as long as the vehicle population continues to grow, the emissions rate per mile must gradually be reduced or pollution will rise. Without these additional controls, continued growth in vehicles will cause an upturn.

While these requirements are clearly intended to be technology forcing in light of the serious and pervasive air pollution problems described earlier, they are quite modest compared to those which occurred during the early 1970's. At that time, not one single car was on the road which was equipped with a catalytic converter much less having achieved the standards for 50,000 miles. Most cars were not designed to operate with unleaded fuel and most gas stations didn't even sell it. With regard to the electronic control systems which have become such an

integral part of today's systems, they were not even envisioned by the technology forecasters. In 1988, on the other hand, fifteen years before the requirement is imposed, as is illustrated in Figures 28, 29 and 30, some models have already certified to these levels for 50,000 miles. (Table 4 Lists some of the models which already achieve these levels in certification.) As fuels continue to improve, electronics evolve and technology advances, the second step seems quite modest by comparison to the earlier push. The GM data cited earlier shows that gradual evolutionary improvements are likely when standards remain in place for several years. This standard will assure that manufacturers continue to work toward minimal pollution from this dominant source. Clearly the experience of the past decade shows that great progress can occur when Congress provides a clear strong mandate.

C. Light Trucks

Light trucks are in most characteristics very similar if not identical to cars, usually equipped with identical engines and drive trains, etc., and are usually driven in much the same fashion; therefore, they should be able to apply the same technology. The lighter category of these trucks (those under 3750 lbs.) should be able to achieve the same emissions levels as those achieved by cars and they are therefore already required to do so in California. Heavier light trucks above 3750 lbs. should have no difficulty achieving the standards in this bill which are adjusted to compensate for their additional weight.

According to the Motor Vehicle Manufacturers Association, about two-thirds of all light trucks of 10,000 lbs. GVW or less are used primarily for personal transportation. About three-quarters of all compact pick ups are principally used to drive to and from work.

D. Light Duty Diesel Particulate

The State of California has adopted a standard of 0.08 grams per mile which went into effect this year. When EPA first adopted the 0.2 gram per mile particulate standard in 1980, it expected that most vehicles would require the use of particulate trap oxidizers to meet the standard. Engine controls have exceeded EPA's expectations (as well as the levels the auto industry testified to EPA it could achieve), indicating once again how well auto industry engineers are able to respond when faced with a difficult challenge. However, trap technology has also been coming along. Further improvements will be fostered by making it clear that current emissions rates are not satisfactory. They are still much higher than from gasoline fueled vehicles.

TABLE 4

1988 Certification Results

MFR	EXFM	DISP	ETW	DFID	NMH	HCCL	COCL	NXCL
FORD	JFM1.6V5FZK0	1597	2500	F	N	0.06	0.52	0.06
PEUG	JPE2.2V5FAA8	2165	3500	C	N	0.09	0.67	0.17
PEUG	JPE2.2V5FAA8	2165	3500	F	N	0.09	0.67	0.17
PEUG	JPE2.2V5FAA8	2165	3250	F	N	0.09	0.71	0.17
PEUG	JPE2.2V5FAA8	2165	3250	C	N	0.09	0.71	0.17
GM	J1G2.5V5TPG4	2500	3000	F	N	0.11	0.76	0.15
GM	J1G2.5V5TPG4	2500	3000	C	N	0.11	0.77	0.15
GM	J2G3.8V8XEB0	3800	3750	F	N	0.08	0.78	0.15
GM	J2G3.8V8XEB0	3800	3750	C	N	0.08	0.79	0.15
PEUG	JPE2.2V5FAA8	2165	3625	F	N	0.11	0.84	0.18
PEUG	JPE2.2V5FAA8	2165	3625	C	N	0.11	0.84	0.18
VOLK	JVW1.8V5FWB3	109	2750	C	N	0.12	0.95	0.06
VOLK	JVW1.8V5FWB3	109	2750	F	N	0.12	0.95	0.06
GM	J2G3.8V8XEB0	3800	3750	F	N	0.1	1	0.18
GM	J2G3.8V8XEB0	3800	3750	C	N	0.1	1	0.18
AMC	JAM2.5V5LAC5	150	3250	F	N	0.09	1	0.11
FORD	JFM1.6V5FZK0	1597	2625	F	N	0.1	1	0.2
AMC	JAM2.5V5LAC5	150	3250	C	N	0.09	1	0.11
AMC	JAM2.5V5LAC5	150	3250	C	N	0.09	1.1	0.1
AMC	JAM2.5V5LAC5	150	3250	F	N	0.1	1.1	0.1
FORD	JFM1.6V5FFX0	1597	2625	F	N	0.11	1.1	0.13
SUZU	JSK1.0V2FFCX	994	2000	C	N	0.07	1.2	0.2
GM	J1G1.6V5XRG7	1600	2500	F	N	0.12	1.2	0.19
SUZU	JSK1.0V2FFCX	994	2000	F	N	0.07	1.2	0.2
VOLK	JVW1.8V5FWB3	109	2750	F	N	0.11	1.3	0.07
TOKO	JTK1.6V5FFT2	1597	2625	F	N	0.12	1.3	0.06
HYND	JHY1.5V2FCB4	89.6	2500	C	N	0.11	1.3	0.15
VOLK	JVW1.8V5FWB3	109	2750	C	N	0.11	1.3	0.07
MITS	JMT2.6V5FBCX	155.9	3500	F	N	0.08	1.4	0.15
MITS	JMT2.6V5FFC7	155.9	3500	F	N	0.08	1.4	0.15
CHRY	JCR2.5V5FBD5	135	3000	C	N	0.12	1.9	0.2
GM	J1G1.6V5XRG7	1600	2500	F	N	0.09	1.6	0.21
HYND	JHY1.5V2FCB4	89.6	2500	C	N	0.12	1.7	0.21
SUZU	JSK1.0V2FFCX	994	2000	C	N	0.1	1.2	0.22
SUZU	JSK1.0V2FFCX	994	2000	F	N	0.1	1.2	0.22
AMC	JAM2.5V5LAC5	150	3250	C	N	0.1	1.7	0.23
AMC	JAM2.5V5LAC5	150	3250	F	N	0.12	1.7	0.23

TABLE 4 - continued

1988 Certification Results

GM	J1G1.6V5XRG7	1600	2625	F	N	0.09	2	0.25
GM	J1G1.6V5XRG7	1600	2500	F	N	0.11	1.7	0.26
AMC	JAM2.0V5FGA5	1965	2625	F	N	0.09	1.5	0.27
GM	J1G2.0V5XAG7	2000	2875	F	N	0.11	1.4	0.28
AMC	JAM2.5V5LAC5	150	3250	C	N	0.08	0.84	0.28
AMC	JAM2.5V5LAC5	150	3250	F	N	0.08	0.84	0.28
ISUZ	JSZ121V5FDA4	121	3250	C	N	0.12	1.6	0.32
TOTA	JTY2.0V5FBDX	1998	3500	F	N	0.11	0.66	0.32
TOKO	JTK1.3V5HRB6	1308	3375	F	N	0.1	0.39	0.32
TOKO	JTK1.3V5HAD3	1308	3125	F	N	0.11	0.26	0.32
ISUZ	JSZ090V2FEA7	90	2375	F	N	0.11	1.1	0.34
NISS	JNS2.0V5FAF9	1974	3250	F	N	0.1	1	0.34
AURV	JAW2.7V5F017	163	3500	F	N	0.11	0.86	0.34
ISUZ	JSZ121V5FDA4	121	3250	F	N	0.12	1.5	0.34
HOND	JHN2.7V5FYF1	163	3500	F	N	0.11	0.86	0.34
NISS	JNS2.0V5FDF4	1974	3375	F	N	0.12	1.2	0.34
ISUZ	JSZ090V2FEA7	90	2375	C	N	0.11	1.1	0.34
HYND	JHY1.5V2HFB5	89.6	2500	F	N	0.09	1.1	0.34
HYND	JHY1.5V2HFB5	89.6	2500	F	N	0.09	0.66	0.34
TOKO	JTK1.3V5HAB1	1308	3000	F	N	0.07	0.33	0.35
GM	J1G4.3V5NDA2	4300	4000	F	N	0.11	1	0.35
AMC	JAM2.0V5FGA5	1965	2500	F	N	0.1	1.9	0.36
HOND	JHN1.5V5FCF4	91	2625	F	N	0.11	1.4	0.36
TOKO	JTK1.3V5HRB6	1308	3000	F	N	0.12	0.43	0.36
ISUZ	JSZ090V2FEA7	90	2375	F	N	0.12	1.2	0.37
ISUZ	JSZ090V2FEA7	90	2375	C	N	0.12	1.2	0.37
NISS	JNS2.0V5FDF4	1974	3375	F	N	0.11	1.2	0.38
TOKO	JTK1.3V5HAB1	1308	3375	F	N	0.12	0.43	0.38
TOKO	JTK1.3V5HAD3	1308	3125	F	N	0.12	0.45	0.39
CHRY	JCR2.5V5FBD5	152	3125	C	N	0.07	1.4	0.39
TOTA	JTY1.5V1HFFX	1456	2500	F	N	0.11	1.7	0.39
HOND	JHN1.5V5FCF4	91	2500	F	N	0.11	2	0.42
FORD	JFM1.9V5FFF5	1858	2750	F	N	0.11	1.9	0.42
HOND	JHN1.5V5F1F0	91	2625	F	N	0.09	1.4	0.43
MIT	JMT2.0V2HFC9	121.9	2750	F	N	0.1	0.83	0.44
FORD	JFM3.8V5FFF4	3797	3750	F	N	0.12	0.77	0.46
NISS	JNS1.6V5FBF6	1597	2750	F	N	0.1	1.3	0.47
FUJI	JFJ1.2V2HFFY9	73	2000	F	N	0.11	2.1	0.5
GM	J1G2.8V8XRZ8	2800	3375	F	N	0.12	1.6	0.51
HOND	JHN1.5V5FJF0	91	2125	F	N	0.09	0.69	0.52
HOND	JHN1.5V5FJF0	91	2125	F	N	0.1	0.55	0.54
HOND	JHN1.5V5FJF0	91	2125	F	N	0.08	0.47	0.59

TABLE 4 - continued

1988 Certification Results

NISS	JNS1.6V9HAF4	1597	2250	F	N	0.09	0.93	0.62
HOND	JHN1.5V5FJF0	91	2125	F	N	0.12	0.94	0.62
FORD	JFM1.3V2FZF7	1323	2000	F	N	0.07	0.85	0.64
NISS	JNS1.6V9HAF4	1597	2375	F	N	0.08	1	0.7
HOND	JHN1.5V5FAF0	91	2250	F	N	0.09	3.2	0.73
HOND	JHN1.5V5FCF4	91	2500	F	N	0.12	2.2	0.81

Some might argue that these standards are unnecessary because very few light duty diesels are presently sold in this country - less than one-half of 1% of new cars. However, as we found out during the seventies, demand for diesels can increase dramatically when energy prices rise. (Recognizing this, VW has just recently introduced a new diesel car to the US market.) Based on the increased dependence on imported oil which is unfortunately occurring, it would be a mistake to be complacent about the future.

E. Heavy Duty Trucks

Many medium trucks (8500-14,000 lbs. GVW) are still gasoline fueled and these will need to be equipped with oxidation catalysts to achieve EPA's current HC and CO standards. In my judgment, it is possible to further lower the NOx standard to 1.7 grams per brake horsepower hour for this class of vehicles. Adoption of a 1.7 NOx standard will require the use of the already proven 3-way catalyst technology to these engines instead of oxidation catalysts. As noted by EPA in 1981, "It is the staffs judgement that achievement of the full 75 percent reduction, i.e., a reduction to the level of the 1.01 g/BHP-hr emission target level, is technologically feasible through the application of three way catalyst technology...Additional NOx control, if necessary, could also be provided by EGR." (see page 59 of EPA's 1981 Regulatory Analysis,)

The diesel truck NOx standard can also be reduced below the current requirements. Some trucks are already certifying below 4 grams per brake horsepower hour (g/BHP-hr), the proposed 1994 standard, and with the use of methanol, levels close to 2 g/BHP-hr have already been demonstrated.

S1630 would codify the 1991 and 1994 heavy duty vehicle particulate standards. Writing these standards into the law is extremely important given EPA's track record of delaying the effective dates of standards after they were adopted. EPA's two year delay of the light duty diesel particulate standard is but one example. Similarly, the 1991 diesel bus standards should also be included in the bill.

It is important to note that any engines unable to achieve stringent truck requirements could still be sold if non conformance penalties (NCP's) are paid by the manufacturer. The alternative of setting the standard at the level the poorest engines can achieve is inconsistent with the health and welfare need for maximum feasible control and with the concept of basing standards on the level achieved by the technological leader not the technological laggard. This philosophy has guided the nation in forcing technological developments for HC, CO, NOx and particulates from cars. If we have learned only one thing from the Clean Air Act, it

should be that greatest progress occurs when stringent standards with firm deadlines are adopted.

It is worth highlighting one particular category of existing vehicles - urban buses. Urban buses are important well beyond their numbers for several reasons:

1. Urban buses tend to be used almost continuously in the most densely populated urban corridors where the greatest number of people are concentrated.
2. A large number of such vehicles are already in use, many more will come into service before meaningful federal controls of new buses take effect in 1991, and these vehicles will remain in use for many years before they are replaced.
3. The emission rates from these vehicles are quite high per mile driven compared to other mobile sources.

Taking all these factors into account, retrofitting these vehicles with diesel particulate traps or converting them to alternative fuels are very attractive options.

VIII. FULL LIFE USEFUL LIFE

One of the most serious issues in the Committee Bill is the requirement that standards are to be achieved throughout the actual life of cars rather than only their half life. As EPA has indicated in its recent Mobile 4 emissions model, emissions after 50,000 miles are much higher from in use cars than for cars under 50,000 miles. As further noted by EPA in a recent letter to the Congress, an extension of the useful life is a "clear, straightforward requirement for cars to comply with standards for the actual period of time they are driven on our streets and highways".

In previous rulemakings, EPA evaluated both the feasibility and cost effectiveness of full life useful life for light trucks and heavy trucks and concluded that this element was very cost effective. Accordingly full life has been adopted for these vehicles and is currently in effect. The current law precludes this for cars, a loophole which must be corrected.

IX. COLD TEMPERATURE CO

The current EPA test procedure was designed to test emissions during a trip to work in Los Angeles during a temperature regime of high photooxidant production. However, for CO, other factors become important. Cold engine choking to assure starting increases both CO and HC emissions; at colder temperatures, this is even more important. Heavily congested traffic leads to lower speeds and greater stop and go conditions, leading to higher engine out CO and HC emissions and slower catalyst light off. As a result, the overall CO reductions under the

conditions of most concern are substantially less than the 90 percent intended. EPA presented an analysis at its CO workshop last year which indicated that the CO problem in many areas may not improve in the future because emissions are not adequately controlled under CO specific conditions.

Beyond CO increases, it seems clear that rich A/F excursions typical of cold temperature operation can also increase benzene, H₂S, and other unregulated emissions.

Cold temperature CO requirements should apply equally to all gasoline vehicles i.e., the same percentage reduction should be required from 20 degrees F to 80 degrees F as is required under normal EPA test conditions.

X. IDLE TEST

Some vehicles have been designed in such a way that they can comply with current emissions standards under the Federal Test Procedure while still emitting high concentrations of CO or HC at idle. This is a problem because idle emissions play a critical role in congested urban areas. Therefore control of idle emissions can reduce pollution exposures in the congested center city areas where millions of people routinely commute. Idle emissions are also important in parking areas, shopping malls, etc.

In addition, idle emissions are frequently the mode that is tested during I/M programs. To the extent that manufacturers design vehicles that cannot be adequately checked during idle, it complicates the I/M programs.

XI. AVERAGING TO MEET STANDARDS

The Committee Bill rejects averaging. In so doing, it underscores the basis for the most successful aspects of the current clean air act - setting clear, defined and technologically feasible though forcing requirements to which every vehicle or engine must comply. Alternatively, averaging would open up a quagmire which at a minimum will substantially complicate and weaken the current enforcement program and has the potential to actually lead to higher emissions than from today's cars. Further it undercuts the philosophical underpinnings of the current program in which everyone buying a new vehicle gets one which meets the standards and is protected by a warranty.

Under today's law, the major pressure on manufacturers to build clean vehicles is the threat of recall. Under this program, when a substantial number of properly maintained and used vehicles are found to emit in excess of the (common) standard, EPA can order the manufacturer to tell its customers of the problem and arrange to fix their vehicles free of charge. This has been the most difficult

challenge in Title II of the Clean Air Act and the one which has motivated manufacturers to lower in use vehicle emissions. Averaging substantially undercuts this enforcement tool, allowing manufacturers to promise to clean up some future vehicles as an alternative, thus setting in motion a series of paper exercises while dirty cars or trucks remain on the country's roads.

Individuals no longer would have any assurance that the vehicle which they purchased is clean or any easy recourse if it is not. Effectively, this will make implementation of strong I/M programs, a cornerstone of the overall in use vehicle emissions control program, a much more difficult proposition.

Depending on the design of the program, which has not been defined in the legislative proposal, the standards in effect can effectively be weakened. In the extreme, the average emissions rate from the fleet could legally be as high as the standard; with an every vehicle standard, the average would inevitably be well below the standard. If EPA were to implement the program by averaging across engine families, it is likely that emissions would still in fact be higher than under the current enforcement program. This is because, some vehicle which are already below standards would be allowed to offset other engine families which could then be above standards.

Even if this should not occur, EPA's enforcement resources already limited would be spread even more thinly. Rather than being able to focus its efforts on what it considers most likely to be the worst engine families relative to a common standard, EPA will need to closely investigate all engine families because failure of a "clean" engine family to comply with a "low" standard will be just as damaging to the environment as failure of a "dirty" engine family to comply with a lenient standard. Because the deterrent impact of recall is greatly undercut by averaging over time, manufacturers may be more willing to operate close to the line.

This added complexity is especially of concern at this time because of the dramatic cutback in Agency resources devoted to mobile sources, especially in the area of enforcement. For example, since 1981, the mobile source program has been reduced by over 100 people (about 26%) and has lost almost 15% of its overall budget. Whereas in FY 1980, EPA conducted 51 Recall Investigations of light duty vehicles, in FY 1989 only 17 are planned, a 67% reduction. SEA Test orders have simultaneously been reduced from 39 to 19, a 51% reduction. Fuel outlet inspections have dropped from 10,000 to 2,500, a 75% drop. All this occurred at a time when additional enforcement responsibilities were demanded of the Agency. More stringent heavy duty vehicle standards

should be enforced; to date, it appears that no heavy duty recall testing under the FTP is conducted by EPA. This is especially critical because heavy duty vehicles are essentially self certified by manufacturers with very little EPA oversight.

In contrast, the Committee Bill reiterates that standards are required to be achieved by every vehicle rather than the average of the vehicles. As part of this general principle, it is necessary to assure that every vehicle meets standards as they are mass produced on the assembly line. It would require this by mandating a 10% Acceptable Quality Level (AQL) rather than the 40% which EPA currently allows. (EPA originally proposed to adopt a 10% AQL for light duty vehicles but was required to modify it to a 40% AQL by OMB. Further a 10% AQL was formally adopted for light and heavy trucks by EPA but was subsequently relaxed as part of the "Regulatory Relief" program during the early 1980's.

XII. ENHANCED I/M

Inspection and Maintenance (I/M) programs are intended to detect and bring about the repair of vehicles with excessive emissions levels. They help to maximize the benefits the public realizes from the emission controls installed on their vehicles by encouraging proper vehicle maintenance. I/M has been required as a part of the State Implementation Plans (SIPs) pursuant to Sections 110 and 172 of the Clean Air Act for those states unable to achieve compliance with the CO or ozone air quality standards by the end of 1982.

Inspection and maintenance has a prominent role in many of the most important components of the US Motor Vehicle Control Program. To the extent that I/M identifies, relatively rapidly, vehicles which may be out of compliance this information can be fed back to the Recall and Assembly Line Test programs thereby allowing the EPA to focus investigations and test orders on the most appropriate vehicles. I/M is key to the Warranty program by which individuals can identify equipment defects and it is a requisite for the Warranty against performance defects which are detected by a Federally prescribed short inspection test. It is also the major ingredient in the antitampering, anti-misfueling effort, as the threat of inspection failure is a strong deterrent to tampering and misfueling. Without I/M, therefore, it seems clear that all elements of the in use emissions performance of vehicles are significantly weakened.

While most I/M programs in effect in the US have been adopted in response to Federal requirements, they differ significantly in terms of implementation details. This is because EPA, in specifying the program requirements, recognized the wide variety of local conditions (e.g., labor and land

costs, local - state interrelationships, existence of or lack of a safety inspection program, etc.). In this environment, three main mechanisms for implementing I/M programs have evolved. First is the so-called private garage system in which the inspection is conducted by a local gas station or repair facility which is licensed for this purpose by the government after meeting certain requirements. The most successful of these types of programs include sealed, computerized analyzers which provide increased confidence to all concerned that the inspection test is run correctly and objectively. Alternatively, state operated lanes have been installed solely to conduct inspections (often including safety as well as emissions). Finally, to avoid the expense to the state associated with building centralized facilities, private contractors can be hired to build and operate such a system at no capital cost to the government; the complete expense is paid for over time by fees charged to owners of inspected vehicles. Administrative costs for the government can also be provided by these fees.

Recently EPA has audited some of these programs to see which are working best and which are falling short of their potential. While many programs are working very well, it is clear that many programs need to be improved. The major problems are related to low failure rates (substantially fewer vehicles failing the program than anticipated based upon the test standards adopted) in decentralized I/M programs with manual analyzers. Two of the major problems are poor instrument quality control and the abuse of repair cost limits which allow repairs to be waived if the cost of repairing these vehicles is estimated to be greater than a predetermined value. Most waiver programs are using unrealistically low cost cut offs, based on repair cost data generated during the 1970's. Enhanced I/M could help to solve these problems by requiring computerized, better quality analyzers and raising the cut off for repair cost waivers. At a minimum, better enforcement, especially with sticker based programs, and a lack of commitment in some cases to try to maximize program effectiveness are also problems.

Specific areas of attention should include:

Modifications of the waiver policy to reflect the changing economics of automobiles. Waivers should require at least \$200 for 1975 and later model cars. A mechanism for independent verification of repairs should also be included.

Registration enforcement rather than sticker enforcement should be mandatory. (This would enable linkage of the I/M and Recall programs in new vehicle registrations.)

Mandatory use of computerized analyzers and mandatory analysis of the data from these analyzers should be prerequisites for EPA approval of program designs.

Mandatory assessments of the individual programs by the responsible state agencies to assess its success in achieving its objectives and to make appropriate corrections.

It should be emphasized that all the data collected by EPA leads to the clear conclusion that centralized I/M programs achieve the largest overall emissions reductions in the most cost effective manner. And contrary to commonly held opinions, they usually take less time and are therefore more convenient.

XIII. ONBOARD DIAGNOSTICS

Reflecting another technological advance, Congress should mandate adoption of an onboard diagnostic program similar to California's as a supplement to I/M. S1630 does so. The intent of such regulations is to minimize the large increases in exhaust emissions which occur when emission-related malfunctions exist on in-use vehicles equipped with three-way catalyst and feedback fuel control systems. Vehicles equipped with electronic engine controls incorporate a backup set of engine operating parameters in their computers which maintain adequate vehicle driveability and performance characteristics in the event of a malfunction in the vehicle's emission control system (ECS). The vehicle operator may thus be totally unaware of an ECS malfunction since driveability is retained and the vehicle will continue to operate under high emitting conditions. An onboard diagnostic (OBD) system visually alerts the operator to any detected malfunction and causes the operator to take necessary actions to repair the malfunction. In this way air pollution from motor vehicles is reduced by insuring the ECS is quickly serviced when malfunctioning.

An additional benefit of an OBD system is in assisting the service industry to quickly and properly diagnose and repair malfunctions in the vehicle's ECS. Since the OBD system is an integral part of the vehicle's power plant, it senses computer electronic signals under the various vehicle operating speed and load modes and can thus detect and store intermittent faults which are very difficult to duplicate in the servicing garage. The OBD system also provides a relatively easy means for inspecting vehicles under the I/M program by monitoring the malfunction indicator light.

XIV. LOWER IN USE LEVELS ARE THE KEY

The vehicle manufacturers have correctly pointed out several times in the past that the real objective of the motor vehicle control program is to reduce in-use vehicle emissions and improve air quality. In several ways, S1630 should bring about this result:

- a) By lowering standards - the experience over the last decade has been that as standards have been lowered, in use vehicle emissions were also lowered.
- b) By increasing the useful life requirements which should improve the durability of emissions control components.
- c) By increasing the overall number of and quality of the I/M programs that exist across the country.
- d) By requiring EPA test procedures to reflect actual, current conditions.
- e) By mandating onboard diagnostics.

XV. STRINGENT US CONTROLS BENEFIT THE WORLD

By taking advantage of light duty vehicle emission control advances which have occurred, and by fostering developments in heavy duty controls, S1630, of course, is primarily addressed at improving the US environment; however, I believe it will enable many other countries to also improve and since many environmental problems transcend national boundaries, S1630 should help to improve our global environment.

Across the entire globe, motor vehicle usage has increased tremendously. In 1950, less than 50 million vehicles were on the world's roads. Today, only one generation later, the vehicle population is 500 million, a ten fold increase. The global vehicle population is expected to double again in the next forty years.

Because of this growth and increasing urbanization, the proportion of the world experiencing serious environmental problems from motor vehicle emissions continues to increase. In addition to the serious pollution problems which have plagued the highly industrialized areas of the world, many rapidly industrializing areas are now starting to note similar air pollution problems. Cities such as Sao Paulo, Seoul, Mexico City, Singapore, Hong Kong, Manila, Bangkok, Taipei and Beijing are each starting to experience unacceptable air quality or are projecting that they will in the relatively near future.

Fortunately, in large measure due to the US motor vehicle control program, technologies have been developed which have made it possible to dramatically lower emissions from cars and increasingly countries around the world have been taking advantage of them. For example, most of Western Europe is on the verge of adopting similar controls while some countries such as Austria, Switzerland and Sweden already have. The Netherlands and the Federal Republic of Germany have adopted innovative economic incentive approaches to encourage purchase of low pollution vehicles. Canada has implemented US standards and Mexico will start

to introduce them in 1993. Other rapidly industrializing, developing countries such as Brazil, Taiwan and South Korea have adopted stringent emissions regulations.

Continuing progress in developing lower polluting vehicles in the US, therefore has the potential to significantly improve the environment in many other parts of the world in addition to the US. One side benefit for the US is that since more and more of the serious environmental challenges which we are starting to address transcend US national boundaries (e.g., long range transport problems, global warming, etc.), improvements in other countries will also tend to improve our environment.

XVI. CONCLUSIONS

It has been twelve years since the Clean Air Act has been amended. It seems reasonable to conclude that the provisions adopted now will shape the national air pollution control effort for the remainder of this century. Improving the existing program is necessary not only to fine tune the various elements to address previously existing problems, but also to deal with a number of new and serious problems. Technological and programmatic solutions exist to address these problems but they will not be implemented and the air will not be made clean and healthy unless this Congress mandates very specific standards and steps. S1630 does this and is, therefore, in my judgement worthy of strong support.

I hope this information is helpful to the subcommittee. I would be happy to respond to any questions you might have at this time.

APPENDIX A

XVII. NEED FOR GREATER, STATUTORILY MANDATED CONTROLS

A. Ozone

Photochemical smog results from chemical reactions involving both hydrocarbons and nitrogen oxides in the presence of sunlight. While historically the major strategy for reducing smog has focused on tight restrictions on hydrocarbon emissions, this HC only strategy has clearly not worked. A variety of studies have established that NOx control is also necessary, particularly with regard to the highest and, therefore, most hazardous levels. For example, this conclusion was verified by a panel of experts convened by the Congressionally established, National Commission on Air Quality (NCAQ), which found that, "NOx control as well as HC control is needed." The State of California has reached the same conclusion based on its direct real world experience.

1. Multi Day Episodes

The most severe air pollution periods consist of multi day episodes during which NOx and other smog precursors have long periods of time to interact; under such conditions, even higher ozone values would result if more NOx were emitted because there would be "a high degree of day to day carry over of such key pollutants as NO₂, peroxyacetyl nitrate (PAN), formaldehyde (HCHO) and higher aldehydes, and nitrous acid (HONO)." These pollutants "are the major early morning sources of hydroxyl radicals (OH) which drive the oxidation processes involved in photochemical smog."

2. Downwind Transport

NOx control will also reduce ozone concentrations downwind in transport situations; since many densely populated areas of the United States are "downwind" of other urban centers, NOx and HC control seems the only reasonable course of action to protect public health. The recent draft OTA report detailing the next steps to controlling urban ozone notes that "overall, of 74 consolidated areas that did not attain the ozone standard for the 1983-1985 period, 41 appear to lie within about 100 miles in directions commonly downwind of other nonattainment cities. In most of these cases, reducing both VOC and NOx emissions in the upwind nonattainment areas would help improve air quality in the downwind cities".

Another prominent researcher said it slightly differently,

"Recent research results from our research group indicate there is a critical need to consider

controls on both nitrogen oxides and reactive hydrocarbons if overall oxidant levels are to be lowered...A critical implication of these findings is that without controls on nitrogen oxides the current control policies will simply change the urban ozone problem into a regional scale one."

3. The California Experiment

The California Air Resources Board in a study which supported that state's adoption of a 0.4 gpm NOx standard for passenger cars, light duty trucks and medium duty vehicles concluded, "Since 1978, a period during which both HC and NOx emissions have decreased, daily peak smog season ozone levels have declined significantly in both the central and eastern portions of the basin. It is in these areas that ozone concentrations are the highest and affect the health of both sensitive and healthy individuals."

4. The Ozone Problem Is Serious

The ozone problem is a special concern. First, the problem is widespread and pervasive and appears likely to be a long term problem in many areas unless significant further controls are implemented. For example, almost 90 million Americans currently reside in areas which exceed the air quality standard; many of these individuals suffer eye irritation, cough and chest discomfort, headaches, upper respiratory illness, increased asthma attacks, and reduced pulmonary function as a result of this problem.

In addition, the current air quality standard tends to understate the health effects. For example, new studies indicate:

"that elevated ozone concentrations occurring on some days during the hot summers in many of our urban areas may reduce lung function, not only for people with preexisting respiratory problems, but even for people in good health. This reduction in lung function may be accompanied by symptomatic effects such as chest pain and shortness of breath. Observed effects from exposures of 1 to 2 hours with heavy exercise include measurable reductions in normal lung function in a portion (15 - 30 percent) of the healthy population that is particularly sensitive to ozone."

Other studies indicate that healthy young children suffer adverse effects from exposure to ozone at levels below the current air quality standard.

5. Ozone Doesn't Exist Alone

Along with ozone, a wide spectrum of hazardous components tends to be associated with photochemical smog episodes. The NCAQ expert panel also expressed concern that higher NO_x emission rates would lead to higher ambient concentrations "of other nitrogen bearing pollutants, e.g., NO₂, nitric acid, peroxyacetyl nitrate (PAN), and other nitrates." These latter compounds are traditionally associated with ozone as part of the photochemical smog family.

6. NO_x is Key To A National Ozone Strategy

NO_x control must be a critical element of the national ozone control strategy. In many urban areas, HC and NO_x control is clearly shown to be more beneficial. (OTA concludes this is true for half the areas which have sufficient data for their analysis.) In other urban areas, where the data is mixed, OTA analysis shows that "NO_x controls are expected to be needed to significantly reduce ozone concentrations at some locations within the air basin." And finally, many of these areas are also located downwind of other sources. Again, OTA analyses show that "in most situations, reducing NO_x emissions in attainment areas would either reduce nonattainment area ozone or have negligible effect, but would usually not be counterproductive." Clearly, as a national strategy, NO_x control in addition to HC control is the correct approach.

B. Carbon Monoxide

Carbon monoxide results almost entirely from motor vehicle emissions.

While great progress has occurred in reducing ambient CO levels across the United States - during the last ten years, the national composite average decreased by 36 percent and the average number of exceedences decreased by 92 percent - the problem is far from resolved. About 85 of our major metropolitan areas with a population approaching 30 million currently exceed the carbon monoxide air quality standard.

EPA has indicated that as many as 15 areas in the United States may have intermittent carbon monoxide (CO) problems that could prevent attainment for many years. The importance of CO control has been reinforced by a recent study of tunnel workers in New York City. As noted by the authors:

"Given the magnitude of the effect that we have observed for a very prevalent cause of death, exposure to vehicular exhaust, more specifically to CO, in combination with underlying heart disease or other cardiovascular risk factors could be responsible for a very large number of preventable deaths."

C. Particulate

Many areas already experience unhealthy air quality levels for particulate (PM10) matter. Estimates are that from 70 to as many as 160 areas are above the air quality standard for this pollutant. PM10 comes from many sources but diesel powered vehicles contribute a significant percentage in urban areas. These particles in urban air are of concern because a strong correlation between suspended particulate and variations in infant mortality and total mortality rates has been established. Further, clear evidence emerges from the body of epidemiological literature that implicates particles in aggravating disease among bronchitics, asthmatics, cardiovascular patients and people with influenza. Any significant increase in diesel particulate emissions would add to the difficulty of solving this problem.

Beyond the overall impact on PM10, diesel particles raise a special health concern because they are very small (averaging about 0.2 microns in size). Small particles, which are much more likely to be deposited in the deepest recesses of the lung (alveolar region) and which require much longer periods of time to be cleared from the respiratory tract, have a greater potential to adversely affect human health than larger particles. In addition, when emitted, they remain suspended in the air near the breathing zones of people for long periods of time. For these reasons, the Harvard University Health Effects Project concluded that "particulate pollution should be a public health concern because, even at current ambient concentrations, it may be contributing to excess mortality and morbidity. Furthermore, our recent analyses...indicate that fine particles (FP) and sulfates (SO_4) are among the most harmful particles to public health."

In addition, diesel particulate has also been singled out as especially hazardous and toxic because of its composition. As noted in the Harvard project "most of the toxic trace metals, organics, or acidic materials emitted from automobiles or fossil fuel combustion are highly concentrated in the fine particle fraction". The US EPA has noted that up to 10,000 chemicals may be adsorbed on the surface of diesel particles and drawn deep into the lung with them. Many of these chemical compounds are known to be mutagenic in short term bioassays, and to be capable of causing cancer in laboratory animals.

Other, epidemiological studies have tended to reinforce these concerns. For example, a 1983 study of heavy construction workers found positive trends in lung cancer by length of union membership and a higher than expected rate among retirees. Further, a pilot study of US railroad

workers, conducted by researchers at Harvard, indicated that the risk ratio for respiratory cancer in diesel exposed subjects relative to unexposed subjects could be as great as 1.42, i.e., the possibility of developing cancer may be 42 percent greater in individuals exposed to diesels than in individuals which are not exposed. The follow up study which has now been completed appears to be equally alarming - "Using multiple logistic regression to adjust for smoking and asbestos exposure, workers age 64 or less at the time of death with lung cancer had increased relative odds (1.2-1.4, p less than 0.05) of having worked in diesel exhaust exposed jobs."

During late 1985, the results of several new studies were presented which increased concerns regarding adverse health effects from diesel particulate emissions. In particular;

1. Stoeber (Fraunhofer Institute) reported on carcinogenicity in rodents after long term high dose diesel inhalation. On both mice and rats, malignant tumors increased with exposure to diesel exhaust. With the mice, however, gaseous phase emissions seemed most important whereas with the rats the particles seemed to be the main cause.
2. Brightwell (Battelle-Geneva) reported that unfiltered diesel exhaust produced an increase in lung tumor incidence from 1% to 40%; gasoline emissions reportedly showed no effect.

Beyond the adverse health effects, diesel particles are a nuisance. They degrade aesthetics and material usage through soiling and may contribute directly, or in conjunction with other pollutants, to structural damage by means of corrosion or erosion.

They also contribute to impaired visibility. Because of their composition (primarily carbon based) and size (in the size range of 0.2 microns), they are very high light absorbers and scatterers and therefore have the potential to be especially harmful to visibility.

Finally, exhaust odor from diesel buses has been a significant public concern for many years. Problems associated with diesel odor include "nausea, headache, and coughing; upsetting of sleep, irritation of eyes, nose and throat; and destruction of the sense of well-being and enjoyment of food, home, and external environment."

D. Toxics

Air toxics, such as benzene, have over recent years become an important focus of air pollution control efforts. Often referred to as "non-criteria pollutants" because air quality criteria have not been published by the US Environmental Protection Agency (EPA) to support

promulgation of a National Ambient Air Quality Standard (NAAQS), air toxics have increasingly been the focus of federal, state, and local study and regulation. Activities have been centered on identifying pollutants of concern, evaluating sources and resulting ambient concentrations, and characterizing the health impacts associated with those concentrations.

Historically, stationary industrial sources of air toxics have been the first subject of air toxics regulations and guidelines, in part because of existing permitting authorities at the state and local level. However, in many areas of the United States, area sources, especially mobile sources, appear to be a substantial contributor to the overall health risks associated with air toxics. A variety of studies have found that in individual metropolitan areas mobile sources are one of the most important and possibly the most important source category in terms of contributions to health risks associated with air toxics.

A review of these studies leads to the following conclusions:

1. Unregulated mobile source emissions represent a potentially significant source of toxic compounds.
2. Control of exhaust and evaporative hydrocarbons generally lowers toxic emissions as well; catalytic converters tend to selectively eliminate a greater proportion of the more biologically active compounds and therefore are very beneficial for toxic control.
3. Metallic additives are not desirable because of their well known toxic properties.
4. Alternative fuels such as neat methanol used on vehicles equipped with catalytic converters has the potential to substantially lower toxic emissions from diesel and gasoline fueled vehicles.
5. To the extent that I/M programs tend to maximize the effectiveness of existing hydrocarbon emissions control systems, they are an attractive tool to minimize mobile source toxic pollution.

E. Acid Deposition

Acid deposition reduces visibility, and in sensitive aquatic systems such as small lakes and streams can destroy fish and other forms of life. Most experts conclude that acid deposition has a major role in the destruction of forests throughout central Europe and North America.

Acid deposition results from the chemical transformation

and transport of sulfur dioxide and nitrogen oxides. The major strategy for addressing the acid rain problem should be reductions of sulfur emissions; however NOx controls are important and will be increasingly so over the next ten to fifteen years. At the 1982 International Conference on Acidification of the Environment in Stockholm, it was concluded that the "acidification problem is serious and, even if deposition remains stable, deterioration of soil and water will continue and ~~may~~ increase unless additional control measures are implemented and existing control policies are strengthened." Therefore, the assembled experts from around the world continued, "we know enough to be able to say:

Unless we reduce our emissions of sulfur and nitrogen oxides, more lakes and streams, more groundwater, more soils and forests will become acidified and we will be adding to the economic and aesthetic damage we have already done...Best available technology which is economically feasible should also be applied to reduce NOx emissions from both stationary and mobile sources."

This conclusion was reinforced during the International Conference of Ministers on Acid Rain which took place in Ottawa, Canada during March of 1985. The final declaration of the 10 participating countries commits each to "take measures to decrease effectively the total annual emissions of nitrogen oxides from stationary and mobile sources as soon as possible."

F. Lead

The extremely serious health hazard associated with lead is no longer debateable. Unfortunately, recent studies suggest that lead causes health risks at exposure levels even lower than previously believed. For example, a recent study (Attachment D) concluded that fetuses might be adversely affected by exposure to lead at concentrations well below the current US limit of 25 micrograms per deciliter of blood. In tests of 249 children studied between birth and age 2, the researchers found that children born with lead levels of at least 10 mg/dl scored nearly seven percent lower on developmental tests than children with little or no lead in their blood.

G. Direct NO₂ Health Effects

Nitrogen dioxide (NO₂) is linked with increased susceptibility to respiratory infection, increased airway resistance in asthmatics, and decreased pulmonary function. Even short term exposures to NO₂ have resulted in a wide ranging group of respiratory problems in school children - cough, runny nose and sore throat are among the most common - as well as increased sensitivity to bronchoconstrictors

by asthmatics.

The World Health Organization concluded that a maximum 1 hour exposure of 190-320 micrograms per cubic meter (0.10-0.17 ppm) should be consistent with the protection of public health and that this exposure should not be exceeded more than once per month. The State of California has also adopted a short term NO₂ standard, 0.25 ppm averaged over one hour, to protect public health.

While nitrogen dioxide alone does not significantly reduce visual range, it is responsible for a portion of the brownish coloration observed in polluted air. In addition, nitrogen dioxide and particulate nitrates also contribute to pollutant haze.

Oxides of nitrogen have also been shown to effect vegetation adversely. This effect is even more pronounced when nitrogen dioxide and sulfur dioxide occur simultaneously. Further, nitrogen dioxide has been found to cause deleterious effects on a wide variety of textile dyes and fabrics, plastics and rubber.

Lest it appear that the various concerns related to NO_x are going away, it is important to note that NO_x emissions have approximately tripled in the US since 1950. According to the latest EPA air quality and emissions trends report, national nitrogen oxide emissions increased by 200,000 metric tons per year from 1986 to 1987.

H. Global Warming

Global warming can occur by changing the chemistry in the atmosphere in ways that either allow more of the sun's hot rays to reach the surface of the planet or by reducing the ability of these rays to escape. In the face of "irrefutable evidence" that the chemistry of the upper atmosphere is changing, physical evidence linking these changes to global warming and "observational evidence" that the earth is warming, political and policy oriented institutions and individuals have dramatically increased their focus on the global warming problem.

Much of the public attention on global warming has focused on either chlorofluorocarbons (CFC's) or carbon dioxide (CO₂) as the main culprits in global warming.

CFCs - These are the most potent hothouse gases, now contributing about 15 to 20 percent of the total global warming effect. Approximately one of every eight pounds of CFCs manufactured in the US is used, and emitted, by motor vehicles. (CFCs also are used as a blowing agent in the production of seating and other foamed products but this is a considerably smaller vehicular use.)

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Carbon dioxide - CO_2 is the other major hothouse gas. A single tank of gasoline produces between 300 and 400 pounds of CO_2 when burned. Motor vehicles emit almost 15 percent of the world's output; in the US, motor vehicles are responsible for about 25 percent of the total CO_2 emissions.

Important greenhouse gases include the compounds which cause ground level ozone to form, hydrocarbons (HC) and the oxides of nitrogen (NO_x) because tropospheric ozone tends to hold in heat and thus increases global warming. On a global level, concentrations of ground level ozone are increasing. Researchers who recently reanalyzed a European data set on tropospheric ozone concentrations from the turn of the century concluded that ozone concentrations had doubled over the past 100 years. One commentator described the finding "as remarkable as the observation of a hole in the stratospheric ozone layer over Antarctica and potentially is just as consequential." An analysis of several sites indicates that tropospheric ozone background levels are increasing at a rate of 1 to 3% per year with overall NO_x increases the controlling factor.

It is important to note that global warming may have a significant impact on local ozone air pollution episodes. As recently pointed out by the American Lung Association,

"the increase in ultraviolet B radiation resulting from even a moderate loss in the total ozone column can be expected to result in a significant increase in peak ground based ozone levels." The ALA continued, "these high peaks will occur earlier in the day and closer to the populous urban areas in comparison to current experience, resulting in a significant, though quantitatively unspecified, increase in the number of people exposed to these high peaks."

In its most recent trends report, EPA made the same point.

Carbon monoxide is also important because hydroxyl radicals (OH) which scavenge many anthropogenic and natural trace gases from the atmosphere, are themselves removed by carbon monoxide. As summarized in a recent Science article,

"The highly reactive OH is the primary sink for many tropospheric gases and pollutants including O_3 , CH_4 , CO, and NO. Hence, increases in CH_4 , such as those during the last century [135% increase] could have caused a substantial (20 to 40%) reduction in OH, which in turn, could cause an increase in tropospheric O_3 by as much as 20%. Since CH_4 oxidation leads to the formation of H_2O , an increase in CH_4 , an important greenhouse gas, can lead to an increase in

H₂O in the stratosphere. Likewise, an increase in the CO concentration can tie up more OH in the oxidation of CO. Thus, through chemical reactions, an increase in either a radiatively active gas such as CH₄ or even a radiatively inactive gas such as CO can increase the concentration of several important greenhouse gases."

Thus carbon monoxide emissions are very important for climate modification. This point was reinforced by Dr. Gordon MacDonald,

"Carbon monoxide could thus be indirectly responsible for increasing greenhouse warming by 20 to 40% through raising the levels of methane and ozone...Carbon monoxide participates in the formation of ozone, and also in the destruction of hydroxyl radicals, which are principal sinks for ozone and methane greenhouse gases. Because carbon monoxide reacts rapidly with hydroxyl, increased levels of carbon monoxide will lead to higher regional concentrations of ozone and methane. Measures to reduce carbon monoxide emissions will assist in controlling greenhouse warming."

This is especially significant in view of the evidence that global CO levels are now also increasing.

"the average tropospheric concentration of CO is increasing at between 0.8% and 1.4% per year, depending on the method used to estimate the trend, and the 90% confidence limits of the various estimates range between 0.5% and 2.0% per year."

In short, motor vehicle emissions of HC, CO, and NO_x are not only a major source of adverse health and other environmental effects from ground level pollution but also contribute to global warming. In addition, tropospheric pollution and climate modification have been found to be directly linked by a variety of mechanisms. To deal with these problems in a coordinated fashion requires the minimization of these emissions. It seems likely that over the long term, all feasible control of HC, CO and NO_x emissions will be required. The recent draft EPA study of Climate Modification prepared for the Congress concluded that a global freeze on CO and NO_x is necessary.

However, the Toronto conference on global warming concluded that in the short term, i.e., over the next 15 years, CO₂ reductions on the order of 20 percent will be necessary; over the longer term, reductions of approximately 50 percent from current emissions rates appear necessary to stabilize the global climate. Experience gained during the 1970's and 1980's in the US suggests that the dual goals of low emissions (CO, HC and NO_x) and improved energy efficiency (and therefore lower CO₂) are not only

compatible but mutually reinforcing. However, significant gains in either area are dependent on forceful government requirements.

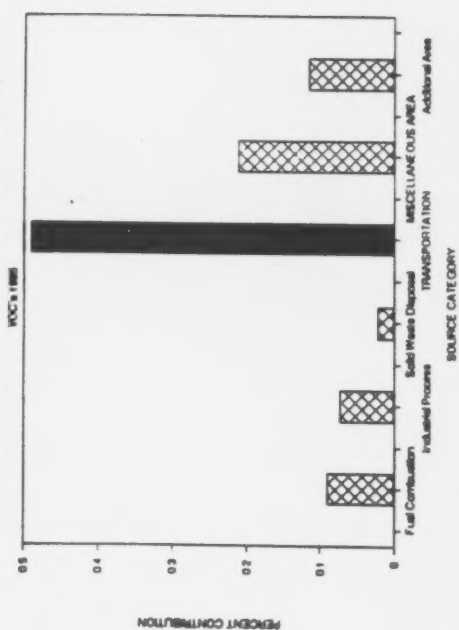
1987 NATIONWIDE EMISSIONS FROM TRANSPORTATION



Source: EPA

FIGURE 1

SOURCES OF NATIONWIDE EMISSIONS



SOURCES OF NATIONWIDE EMISSIONS

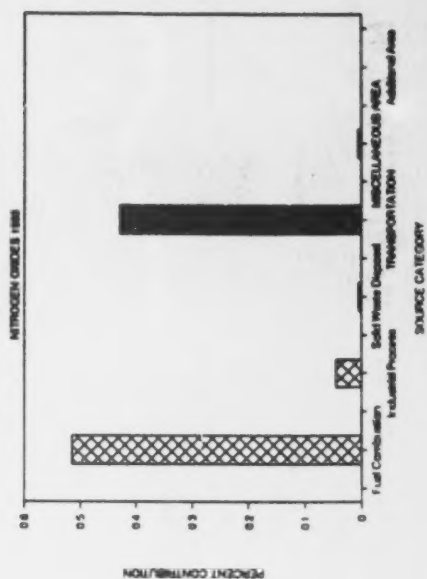


FIGURE 2

Vehicle Miles Travelled Per Year

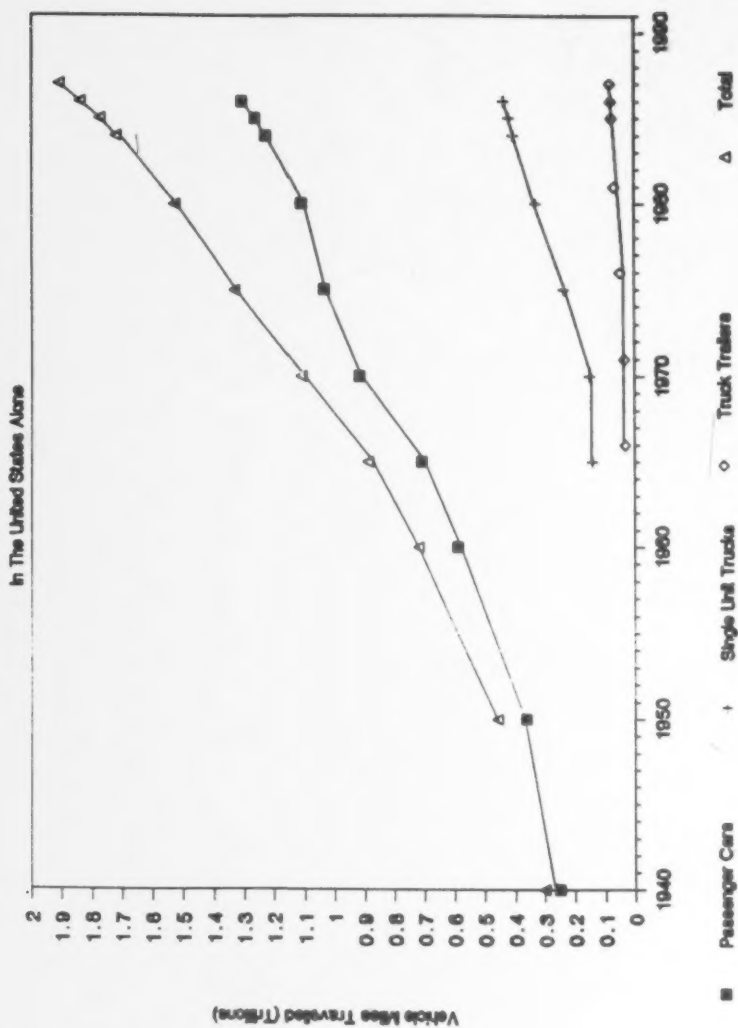


FIGURE 3

Trends In Light Duty Vehicle Emissions

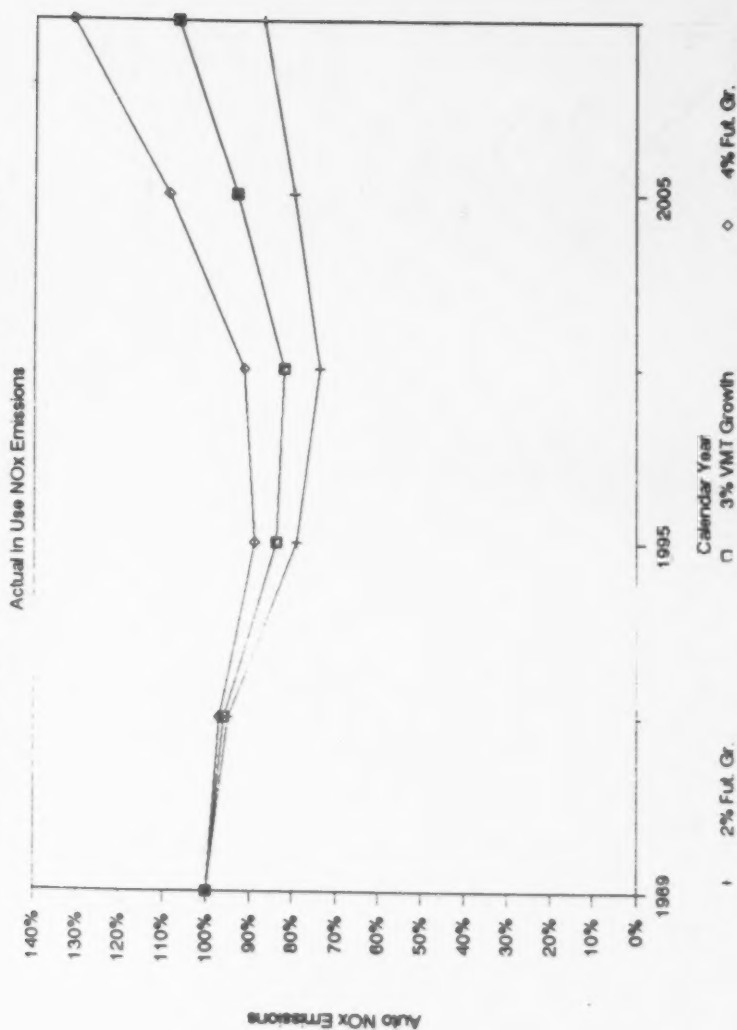


FIGURE 4

Trends In Light Duty Vehicle Emissions

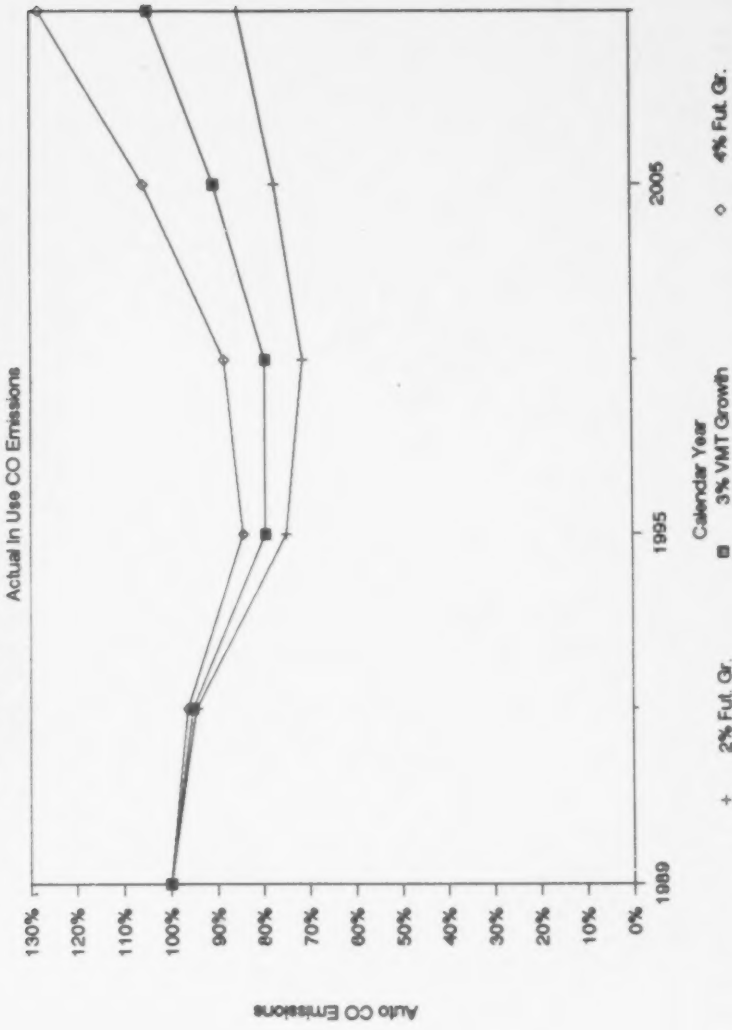


FIGURE 5

Trends In Light Duty Vehicle Emissions

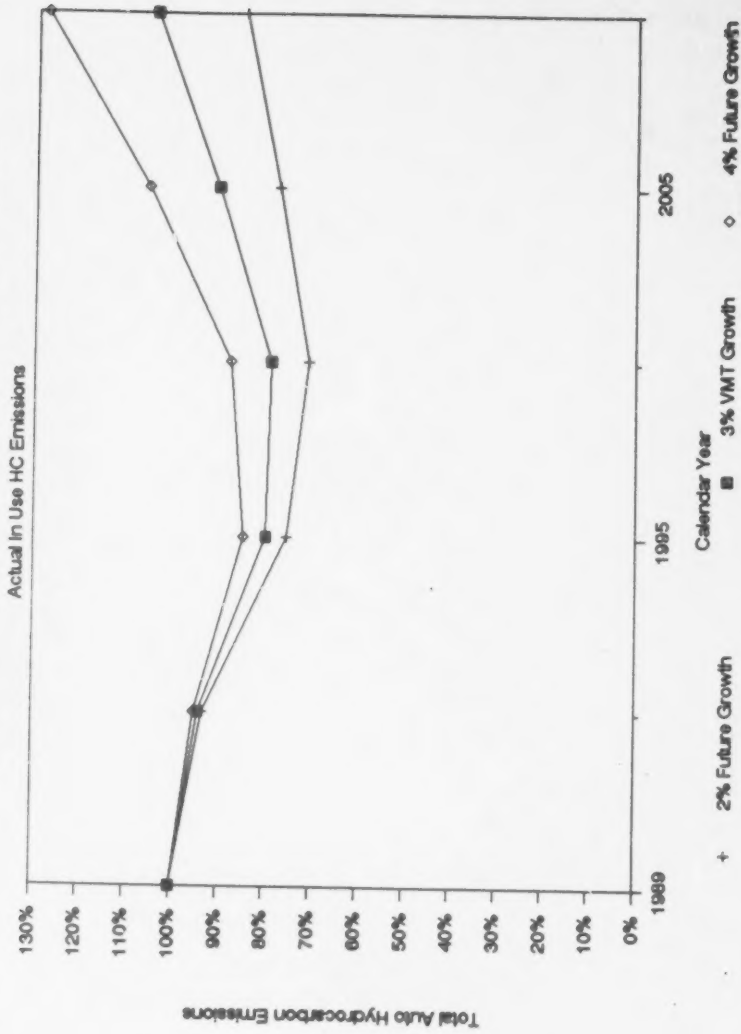


FIGURE 6

Trends In Light Duty Vehicle Emissions

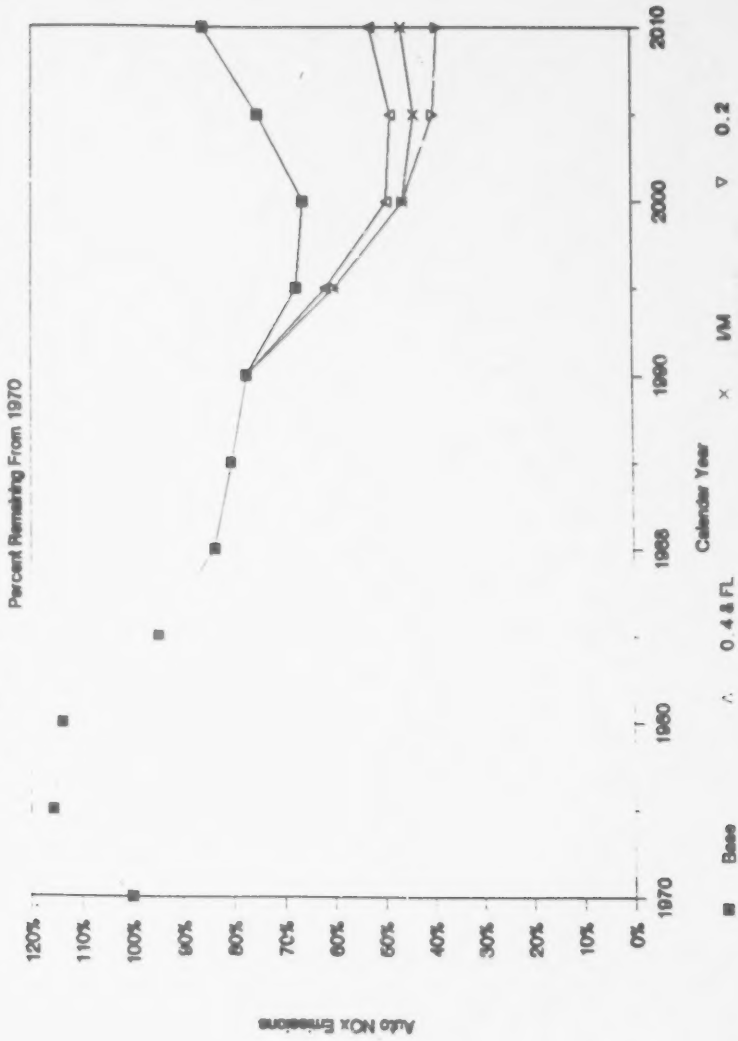


FIGURE 7

Trends in Light Duty Vehicle Emissions

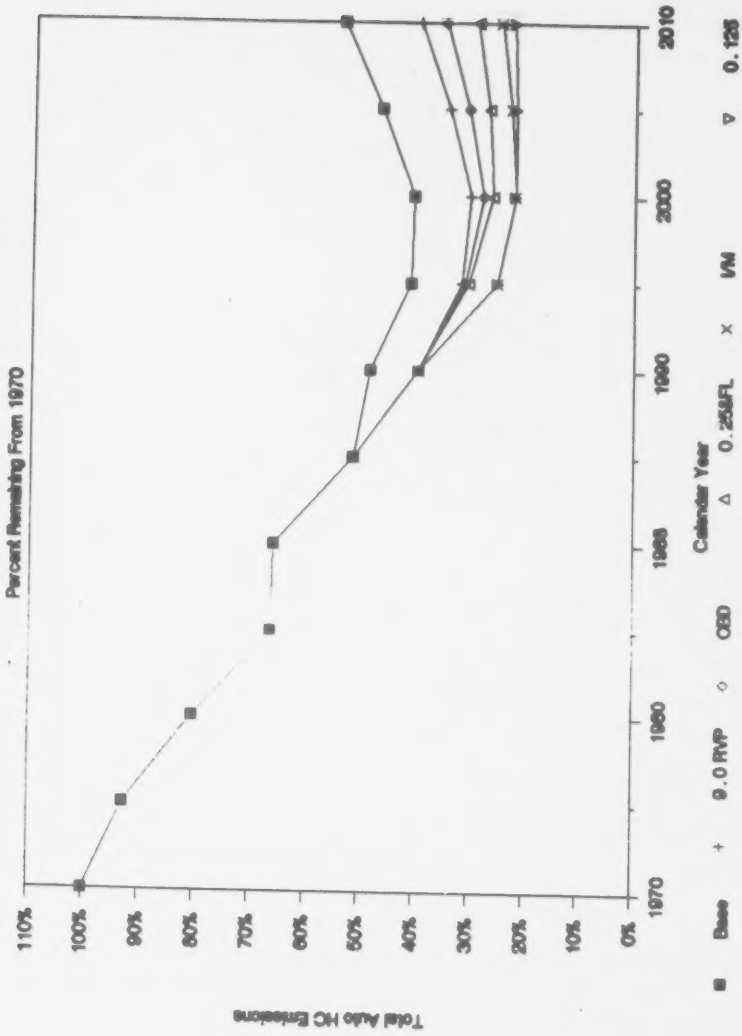


FIGURE 8

Trends In Light Duty Vehicle Emissions

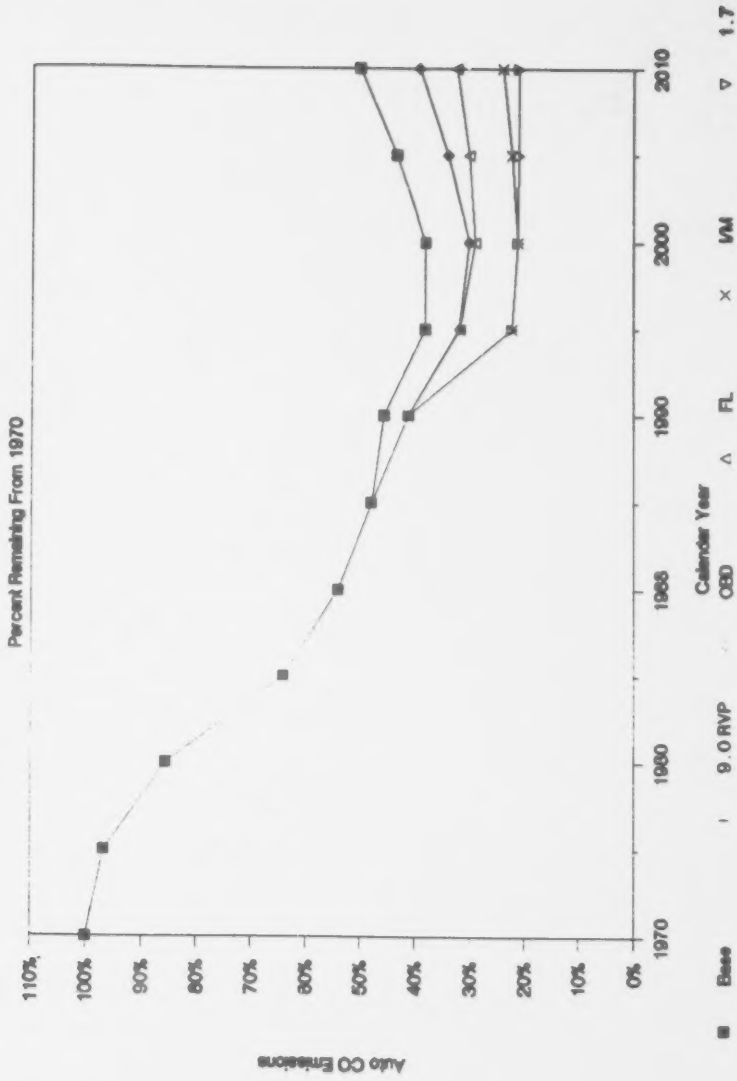


FIGURE 9

GLOBAL VEHICLE POPULATION GROWTH

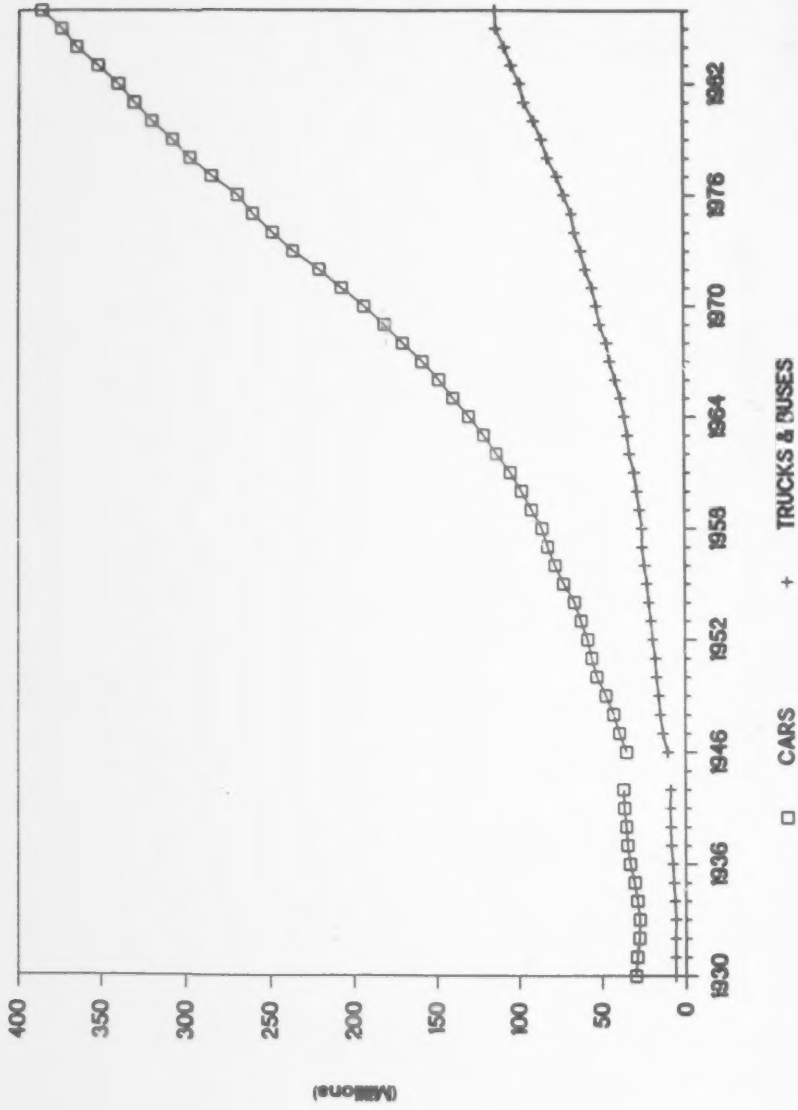


FIGURE 10

GLOBAL CAR POPULATION - 1986

386 MILLION TOTAL VEHICLES

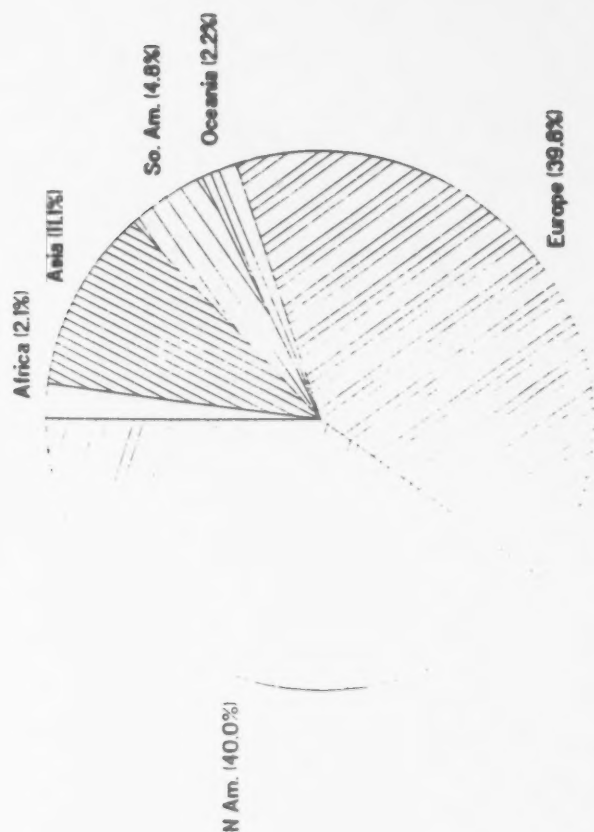


FIGURE 11

GLOBAL TRUCK & BUS POPULATION - 1986

113 MILLION VEHICLES TOTAL

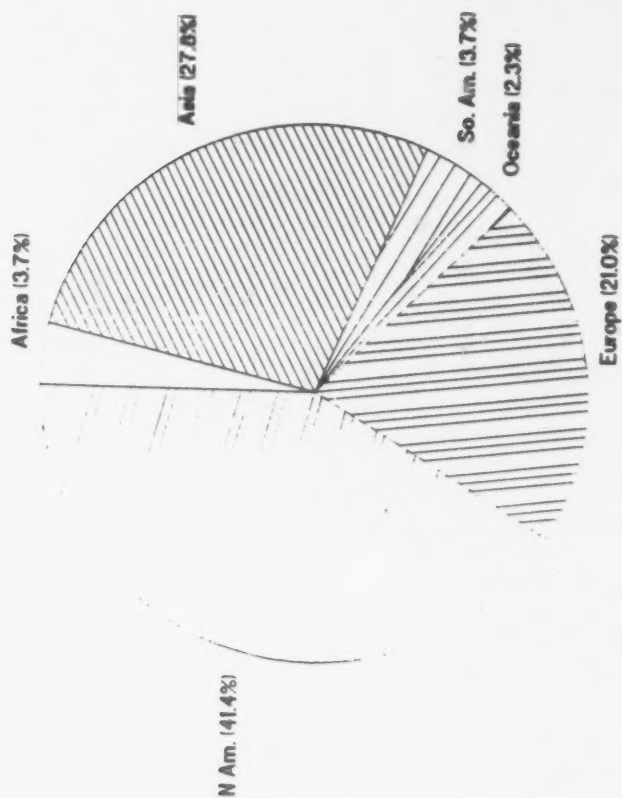


FIGURE 12

AVERAGE FLEET MPG BY MODEL YEAR

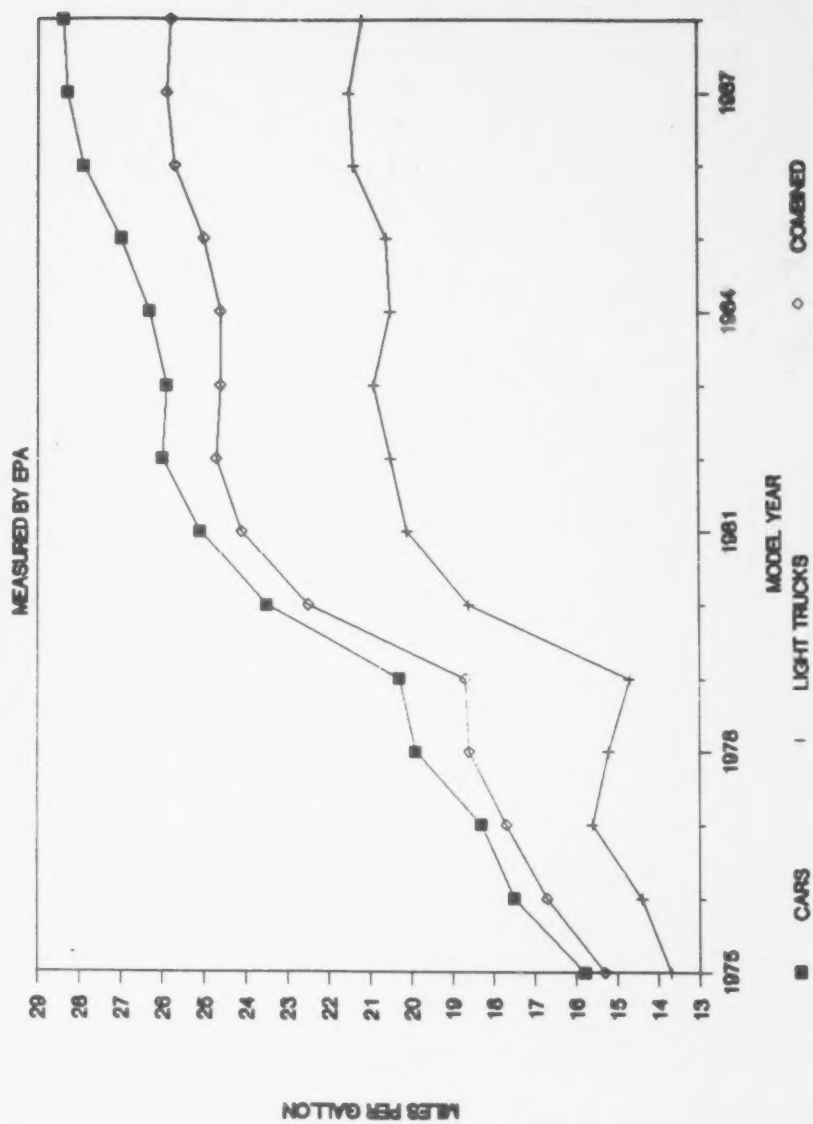


FIGURE 13

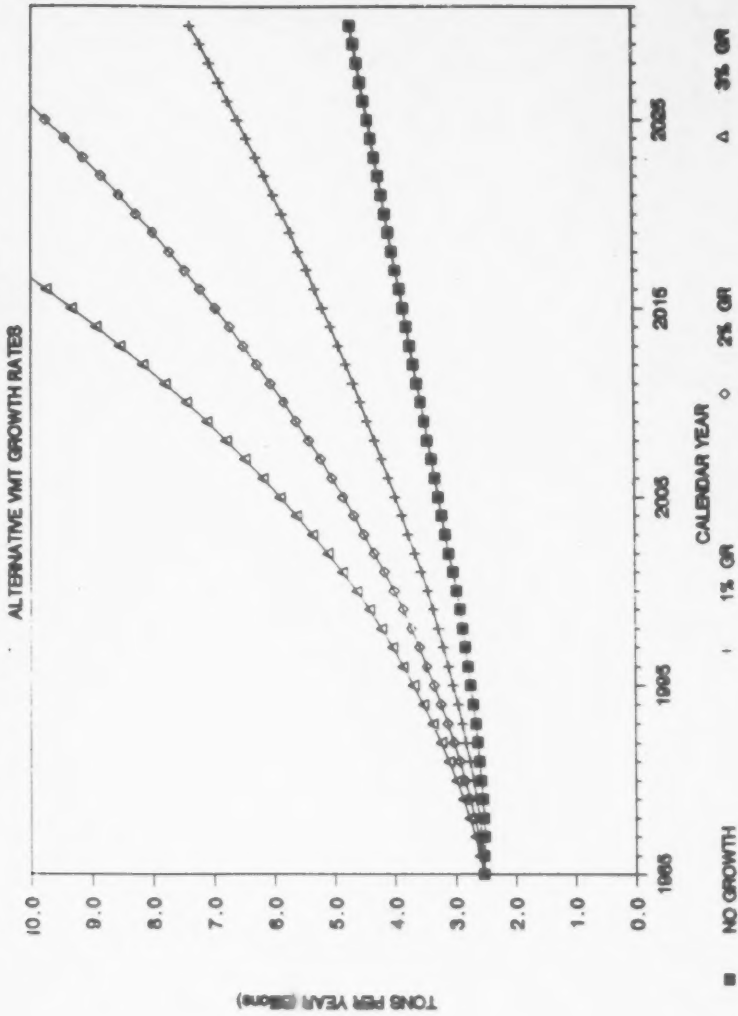
GLOBAL AUTO CO₂ EMISSIONS

FIGURE 14

TRANSPORT ENERGY

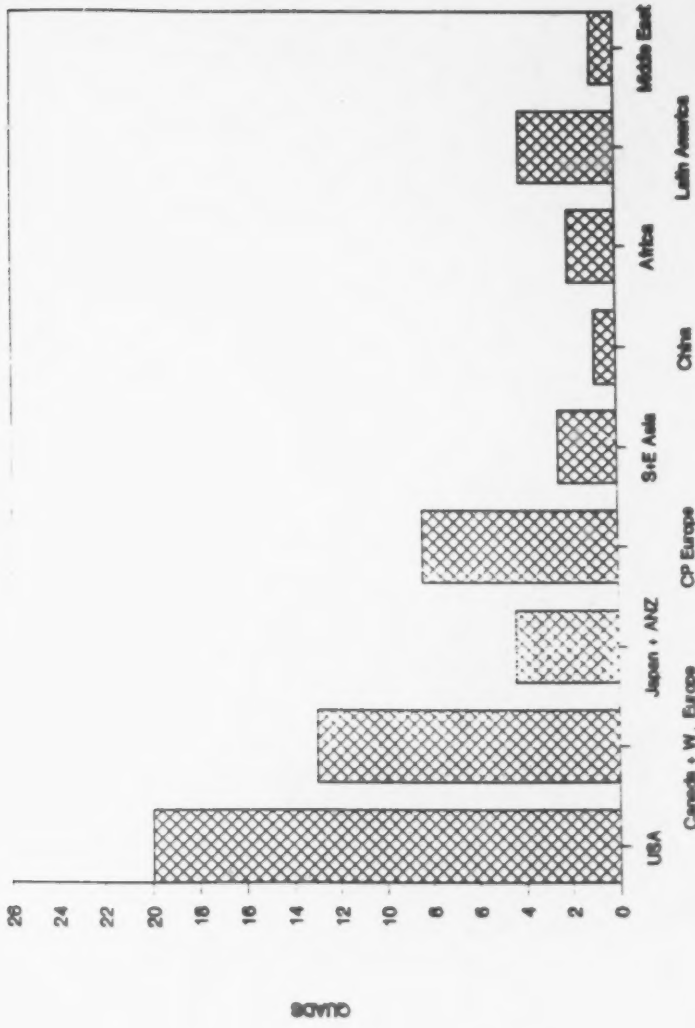


FIGURE 15

SHARE OF WORLD'S TRANSPORT ENERGY

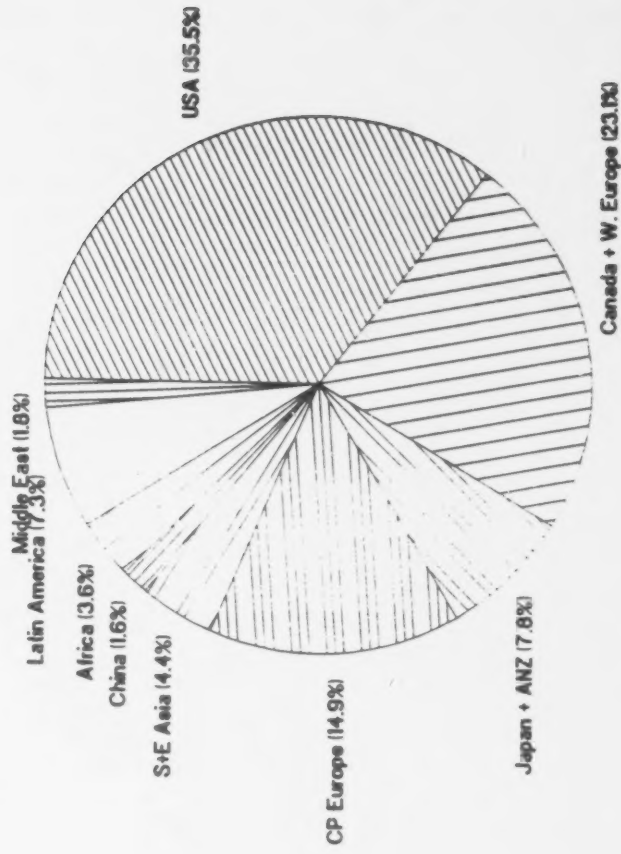


FIGURE 16

TRANSPORT SHARE OF REGION'S ENERGY

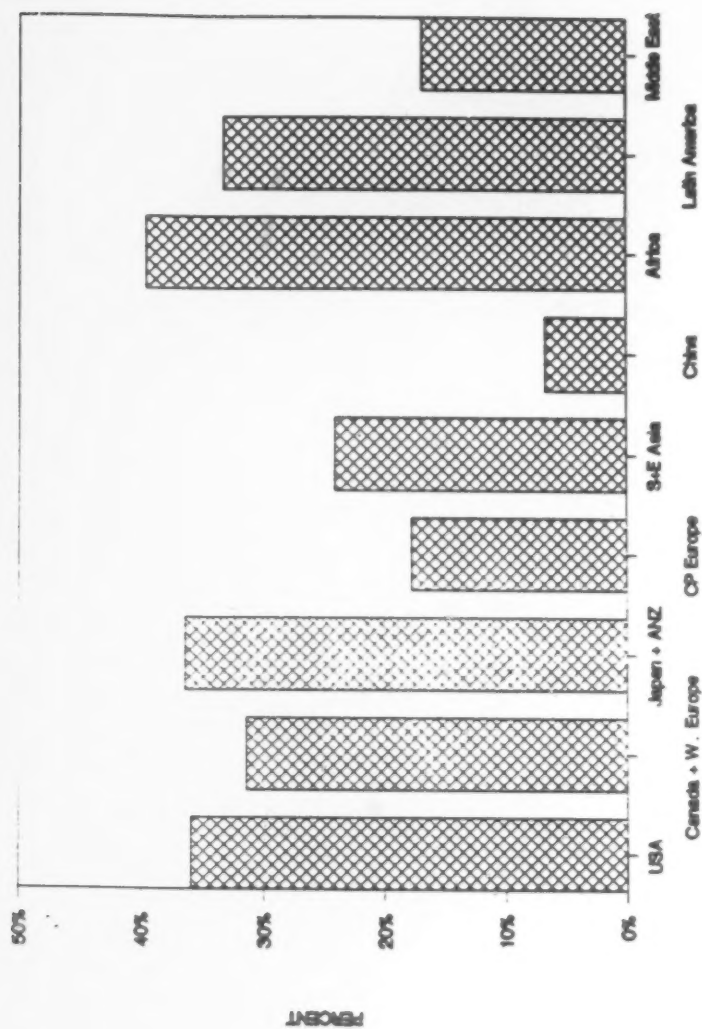


FIGURE 17

TRANSPORT CARBON DIOXIDE

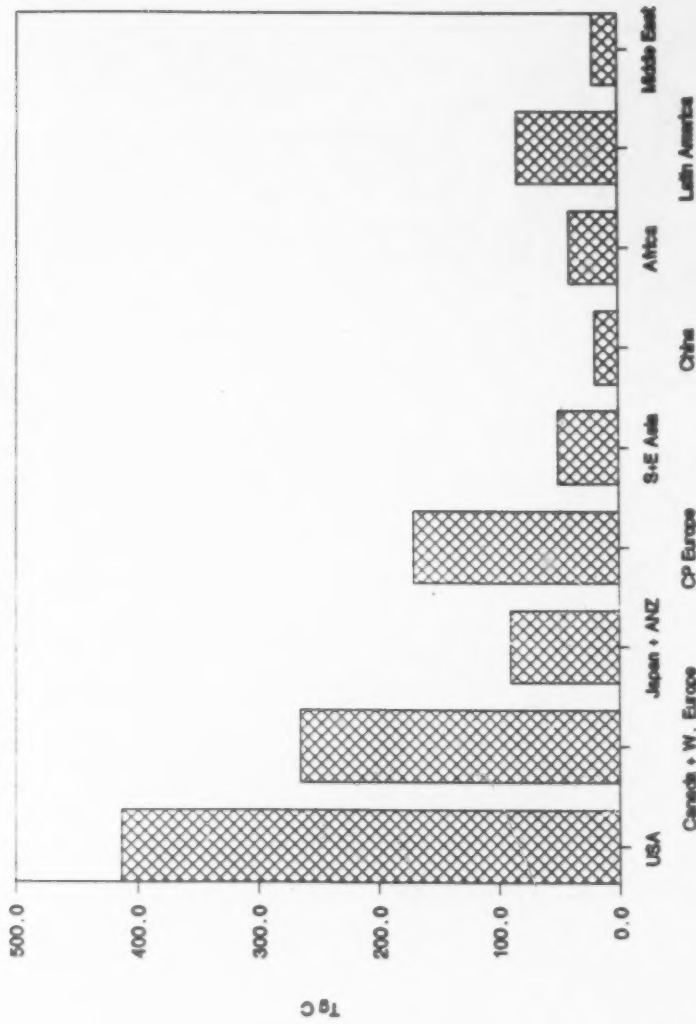


FIGURE 1A

TRANSPORT SHARE OF REGIONS CO2

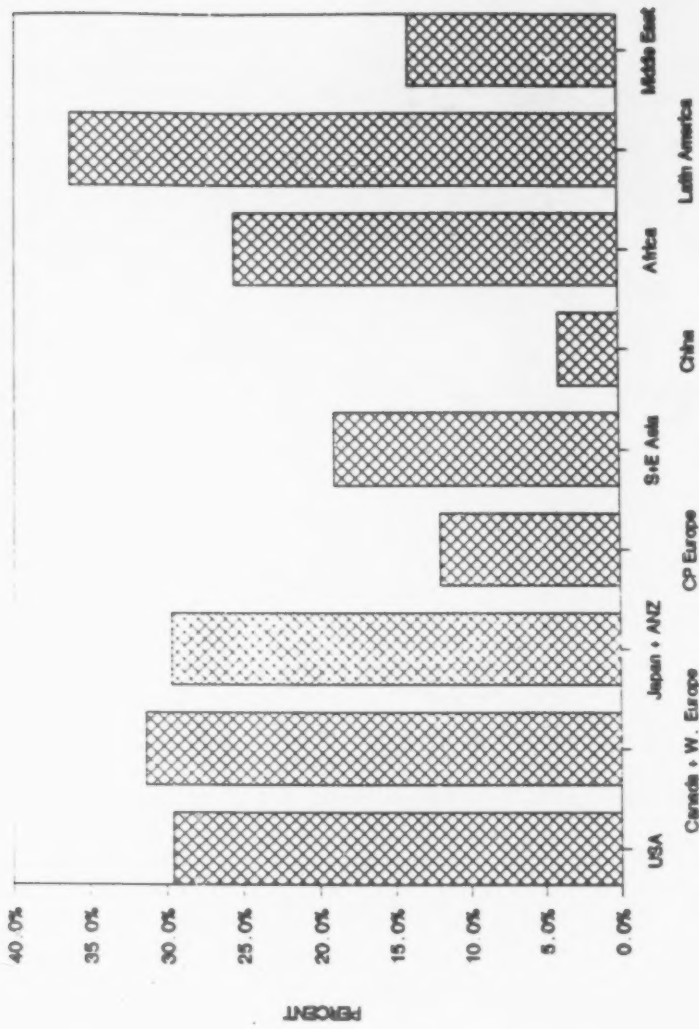


FIGURE 19

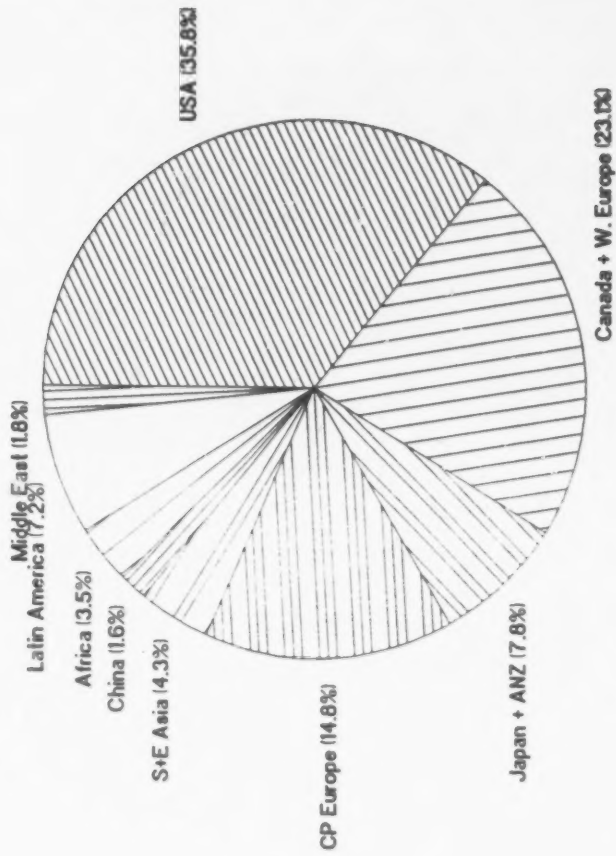
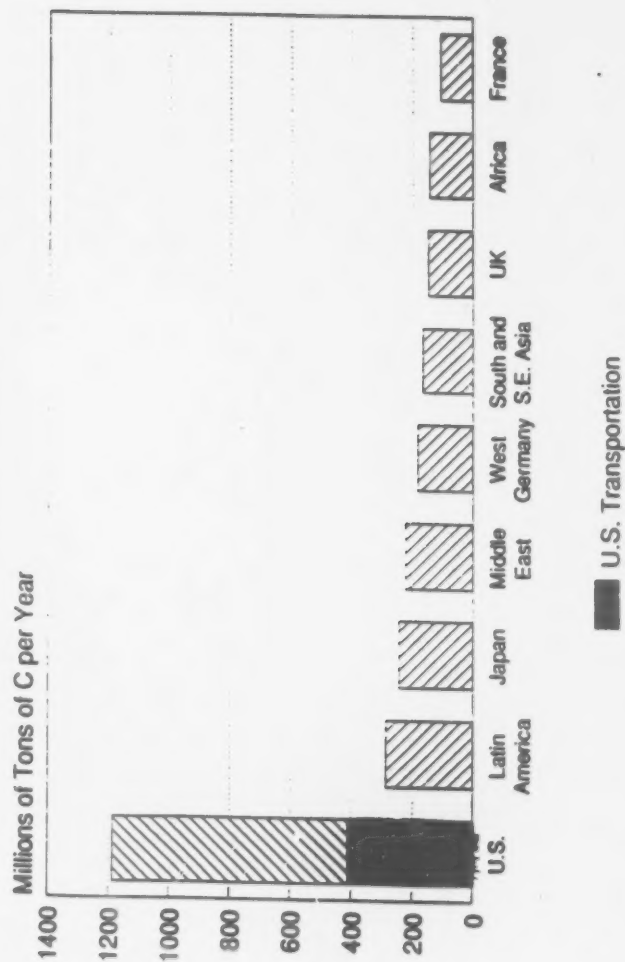
SHARE OF WORLD'S TRANSPORT CO₂

FIGURE 20

CO2 EMISSIONS FROM FOSSIL FUELS FOR SELECTED REGIONS (1985)



Source: World Resources Institute, DOE

FIGURE 21

US AUTO FUEL CONSUMPTION TRENDS

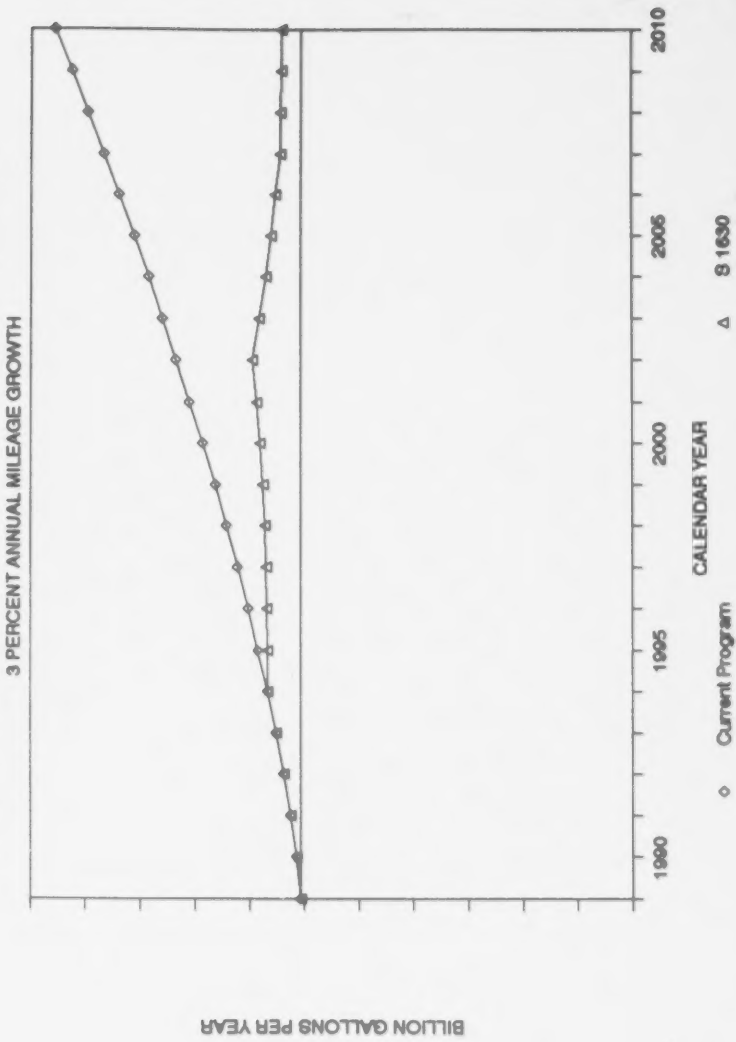


FIGURE 22

US AUTO CARBON DIOXIDE TRENDS

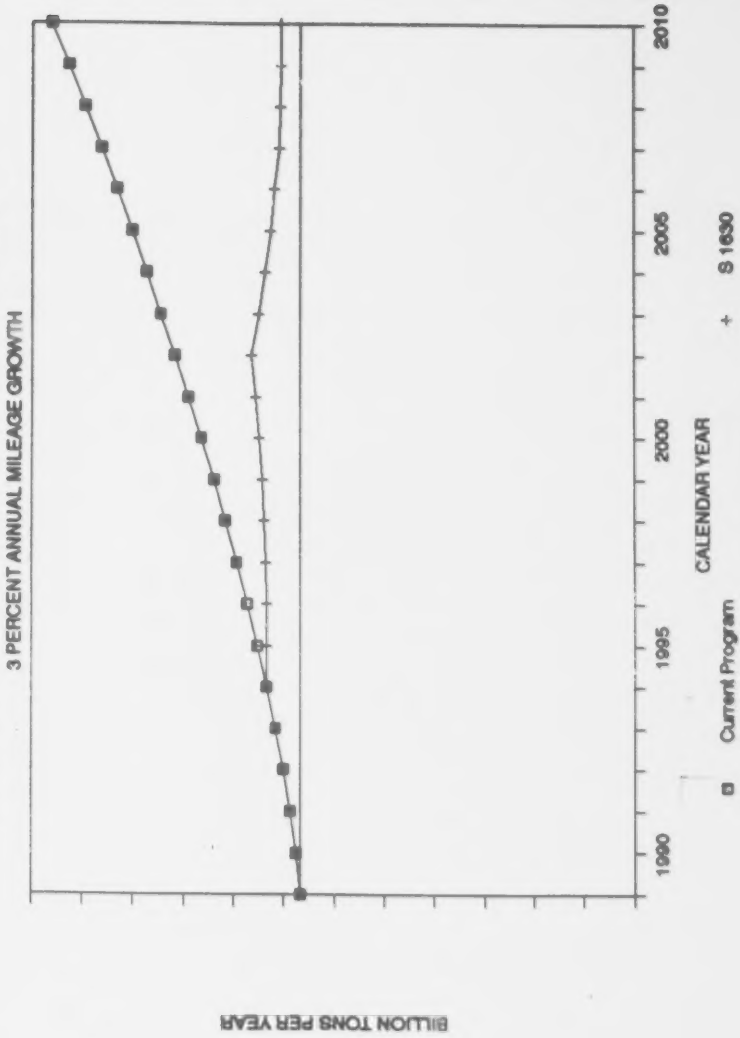


FIGURE 23

RELATIONSHIP BETWEEN NO_x AND CO₂

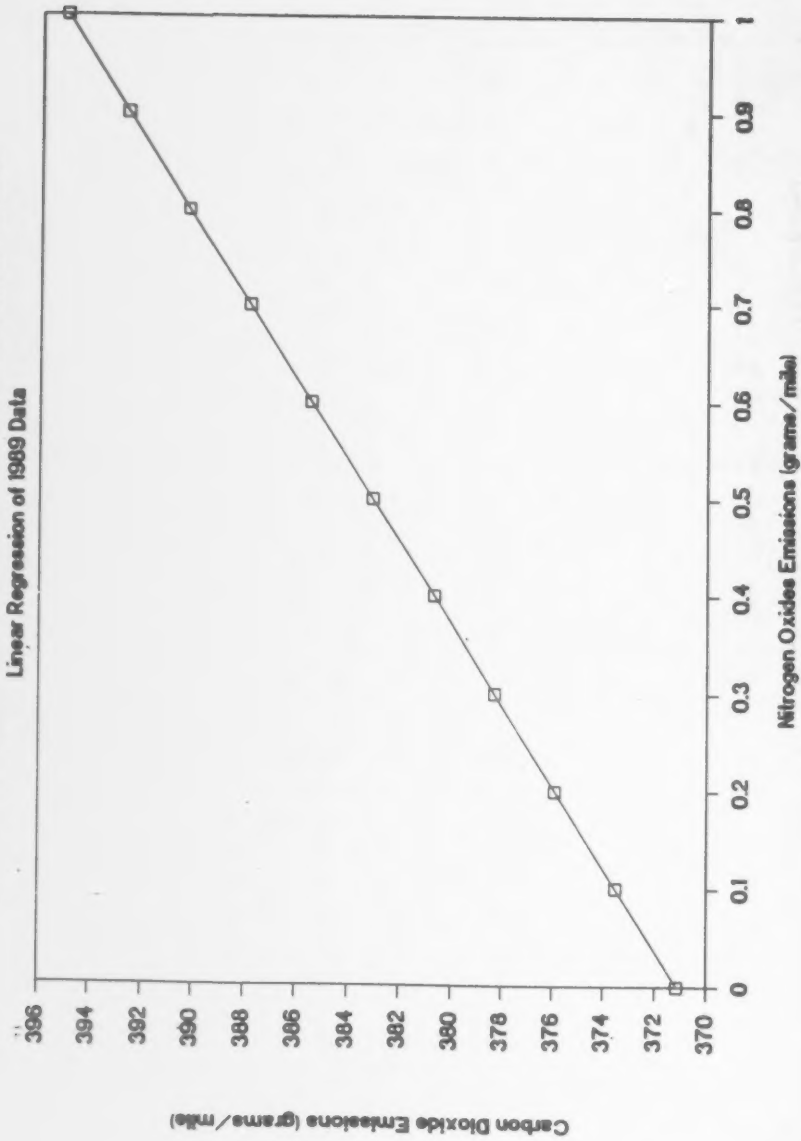


FIGURE 24

RELATIONSHIP BETWEEN HC AND CO2

Linear Regression of 1989 Data

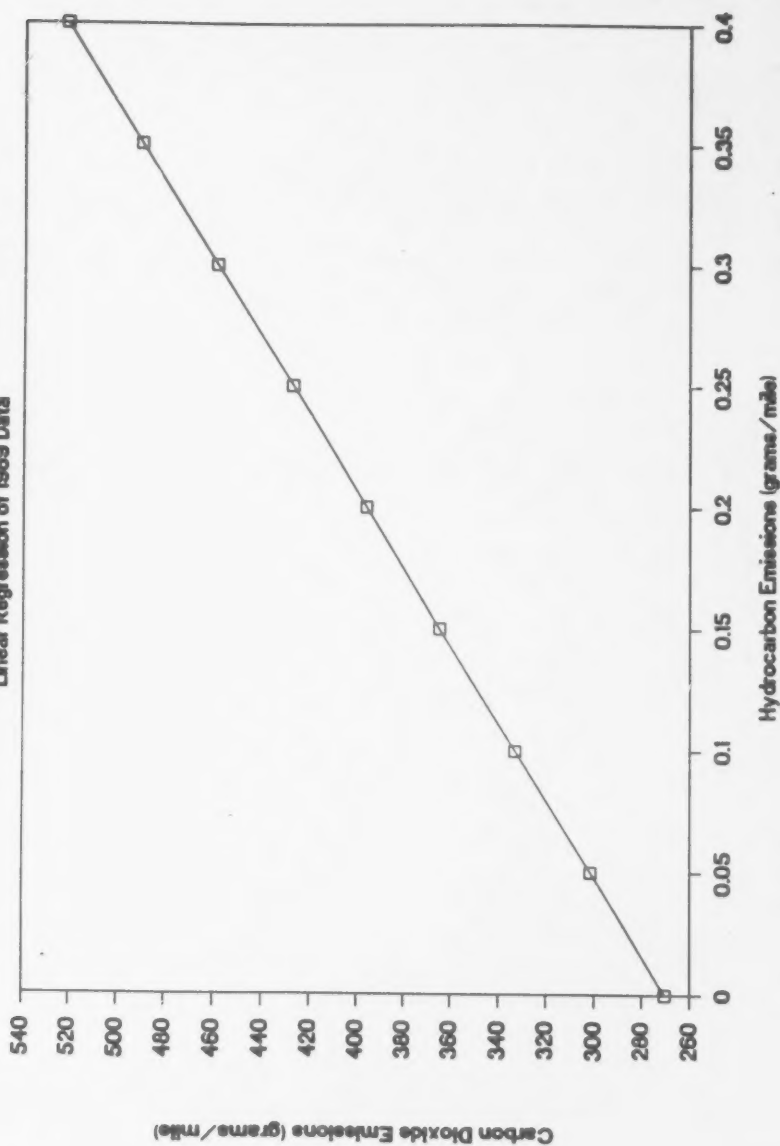


FIGURE 25

RELATIONSHIP BETWEEN CO AND CO2

Linear Regression of 1989 Data

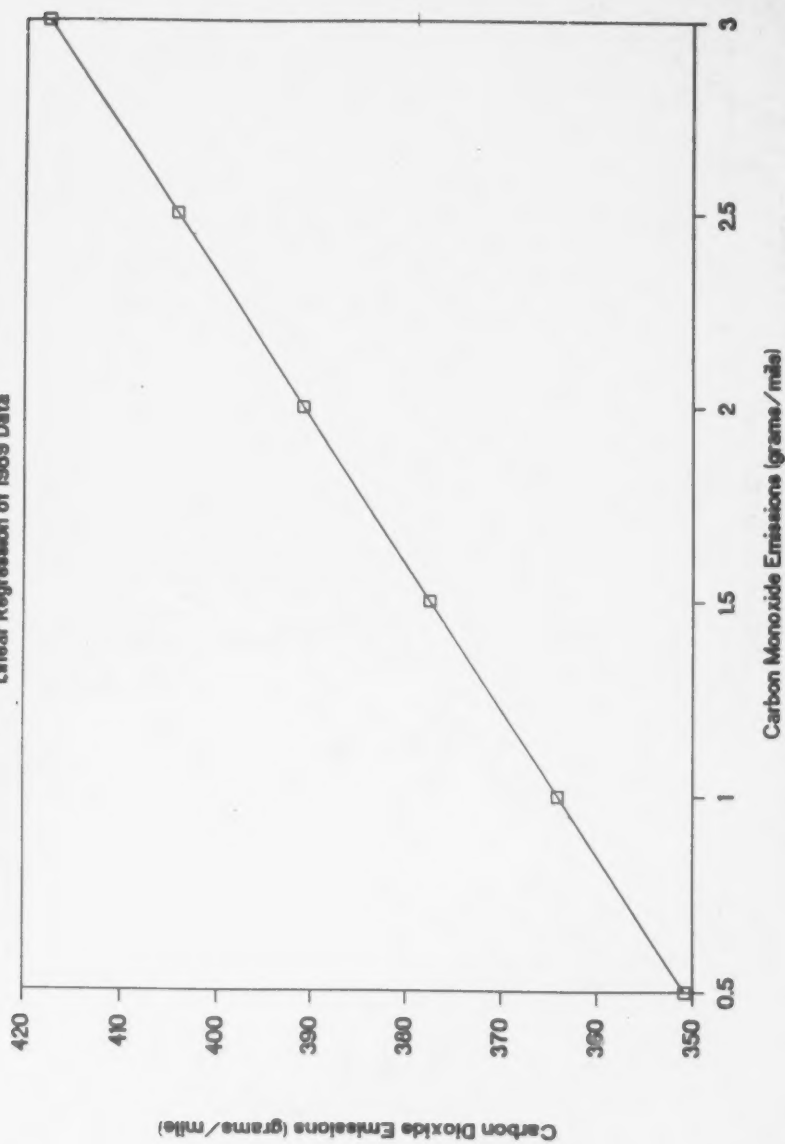


FIGURE 26

FIGURE 27

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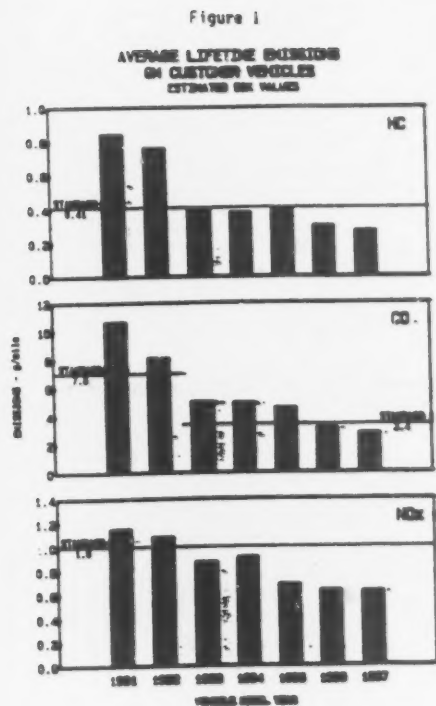
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GM'S RESULTS - THE EPA/INDUSTRY COOPERATIVE TEST PROGRAM

HAROLD M. HASKEN
DAVID P. GARNETT
JAMES J. GUNDELTON

Powertrain Control Center
Current Product Engineering
General Motors Corporation

International Congress and Exposition
Detroit, Michigan
February 27 -- March 2, 1989



1988 CERTIFICATION DATA ALL LIGHT DUTY VEHICLES

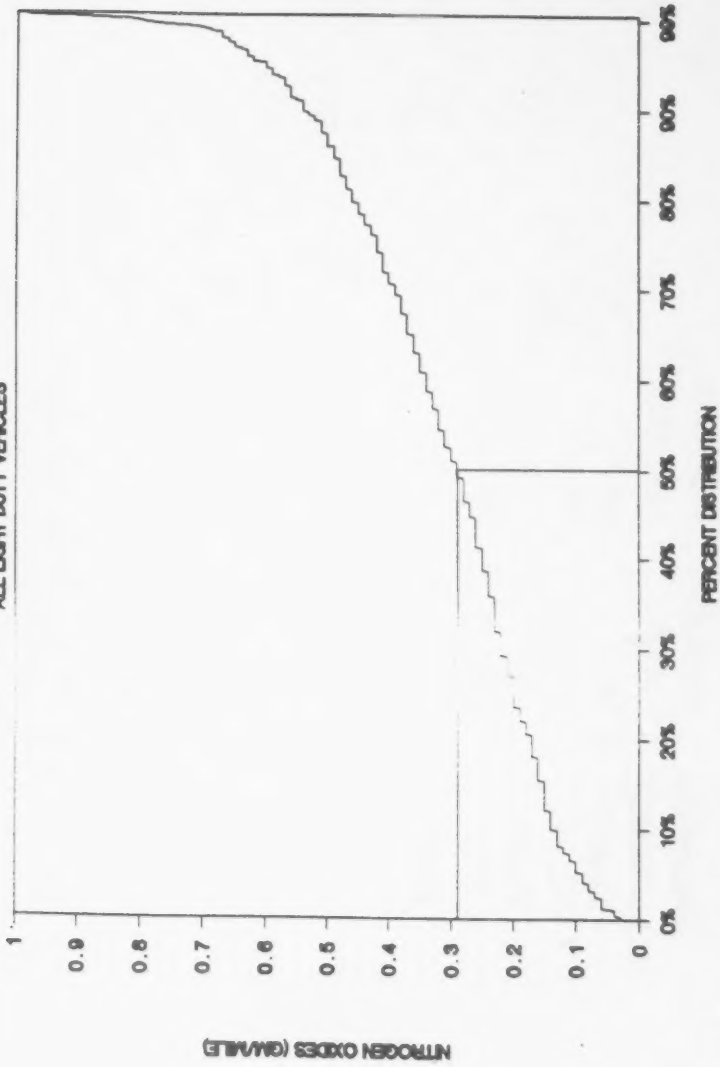


FIGURE 28

1988 CERTIFICATION DATA

ALL LIGHT DUTY VEHICLES

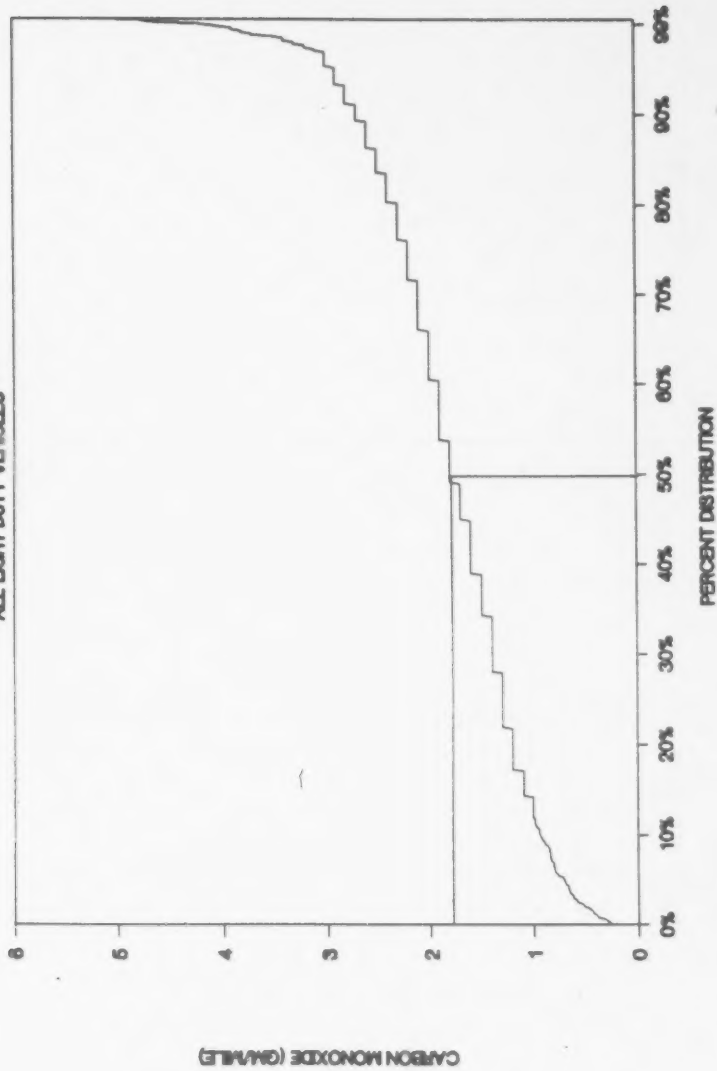


FIGURE 29

1988 CERTIFICATION DATA

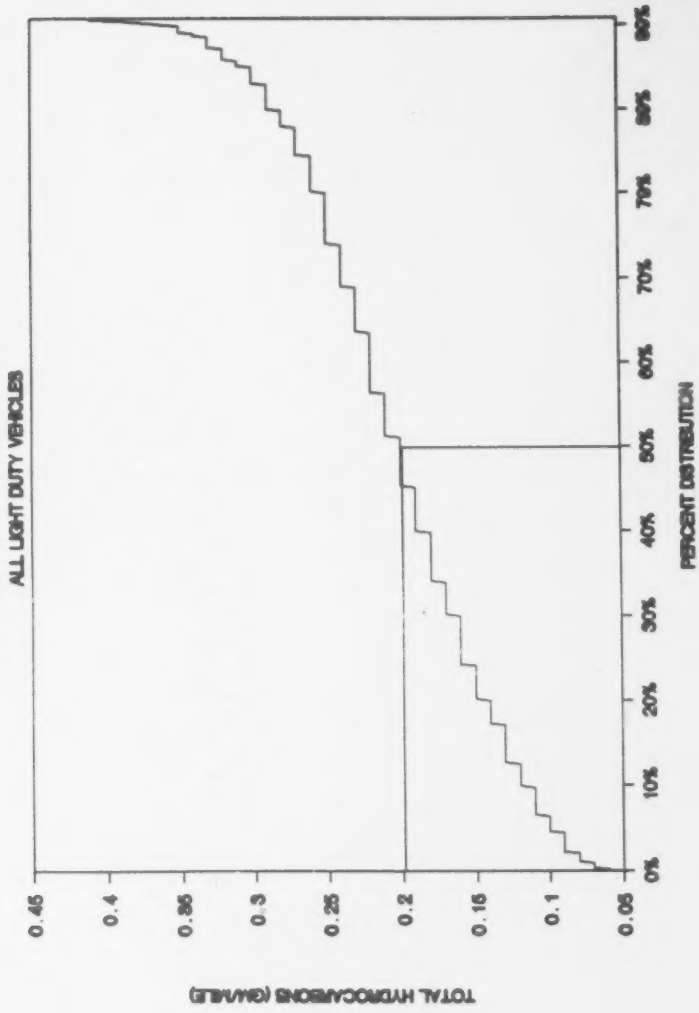


FIGURE 30

October 30, 1989

Senator Max S. Baucus
Chairman
Subcommittee on Environmental Protection
U.S. Senate
458 Dirksen Senate Office Building
Washington, D.C.

Dear Senator Baucus,

Thank you for the opportunity to respond to some of the questions which were not fully addressed during the Subcommittee hearing on September 28th.

Question #1:

The auto industry contends that there has been a 96 percent reduction in auto emissions since 1970 and that the second round would result in very little improvement. Do you believe that this is an accurate analysis?

Answer:

No. This analysis confuses the reduction in emissions standards with actual improvements from the fleet of vehicles on the nation's roads. While a great deal of progress has occurred and while actual emissions from vehicles are much less than they would have been without the statutorily mandated improvements, the actual performance has been much less than intended.

This is illustrated in Figures 1, 2 and 3 which show the trends in vehicle NOx, HC and CO emissions, respectively, over the last two decades. While standards have been tightened by 96 percent (except for NOx which was relaxed to only 76 in the 1977 Clean Air Act Amendments), vehicle growth (estimated at approximately 3 percent per year) and poor in use vehicle emissions performance especially after vehicles pass 50,000 miles has drastically reduced the actual overall emissions reductions. Further, these reductions only occur under the standard EPA test conditions where, for example, temperatures range between 60 and 86 degrees F, average speeds never exceed 55 M.P.H., and vehicles accelerate slowly. Under many real world driving conditions where serious air quality problems occur, emissions reductions have actually been substantially less than in Figures 1, 2 and 3.

For example, Figure 4 illustrates this fact for

hydrocarbons. The first bar shows that the auto fleetwide reduction due to tighter standards would have been approximately 70 percent, if fuel composition had not changed and if no growth had occurred. However, due to changes in the volatility of real gasoline which were not accounted for in EPA testing, the reductions dropped to 60%. Combining this with approximately three percent annual growth in vehicle miles travelled lowered the overall reductions to only about 35%. Finally if these same changes are observed on a hot summer day when photochemical smog is at its peak, the overall reductions have actually only been about 20 percent.

High CO levels in many cities in Winter when temperatures are 20 degrees F or less is another widely recognized example of this real world problem.

To maximize the likelihood of lower actual emissions in the future, the Committee Bill therefore appropriately stipulates a cold temperature CO standard, restricts the volatility of gasoline, requires standards to be met for the full life of a vehicle rather than just 50,000 miles and mandates EPA attention to adjusting its test procedures to more closely reflect real world conditions.

Question #2:

The Administration's proposal allows the auto manufacturers and oil industry to substitute alternative controls for time-tested controls such as tailpipe standards. This is puzzling because we need all the controls possible. It seems to me that, if new methods of controls are developed, we will need these methods in addition to the older ones. What is your view of this alternative controls approach?

I agree that in the future we will need all feasible controls if we are to return to healthy air quality across the country. As noted by the Congressional Office of Technology Assessment in its recent report, Catching Our Breath, Next Steps for Reducing Urban Ozone,

"in the worst areas, even the most costly and stringent of available measures will not lower emission levels sufficiently to meet the standard. Achieving that goal is a long range project, well beyond the 5- and 1-year horizons of existing law. It will require both new technologies and lifestyle changes in the most affected communities, including changes in transportation, work, and housing patterns." (page 5)

Therefore, the overriding principle which should guide us in our quest for alternative fuels, alternative powerplants and advanced conventional technologies should be maximizing the opportunity for and prospects for success in lowering

emissions by each of these options. Rather than closing the door to further development of "conventional" technology, we should take advantage of the very promising developments in this area to "leverage" advances in alternative fuels and powerplants. While I believe that alternative fuels are very attractive and promising, it seems foolish to put all our eggs in that or any other individual basket.

In this World Series time, it seems counterproductive to trade Jose Canseco, even for a very promising rookie. Rather we should try to create an environment in which they both compete and encourage each other to excel. The rookie, alternative fuels, may ultimately prevail, but in the meantime Canseco has many home runs left. And if the promising rookie stumbles along the way or develops a sore arm, we still have the tested veteran.

The cornerstone of our alternative fuels effort, therefore, should be adoption of the so called second stage standards, 0.2 NOx, 0.125 HC and 1.7 CO (3.4 at 20 degrees F) as in the Committee Bill. As noted in my testimony before the Subcommittee, the prospects for achieving these levels at minimal cost are very promising. These controls will then provide a benchmark against which to measure the performance of alternative fuels.

These comments are not intended to discourage development of alternative fuels which I believe have many attractive environmental features. Not the least of these is that the prospects for alternative fuels can and already have encouraged advances in conventional fuels and vehicles. This competition should be encouraged and maximizes the prospects for clean air in the future.

Question #3:

I am concerned that the Administration's bill provides no standards for heavy trucks and that, in the past, EPA has set these standards only in response to lawsuits. What is your view of the Administration's approach to heavy duty trucks?

I think it is very appropriate to be concerned about this proposal. If we have learned one thing in the past two decades it is that the greatest progress occurs in response to clear Congressional mandates. In spite of the problems noted above in response to question #1, no one seriously doubts that from an emissions standpoint we are much better off as a result of the specific legislative mandates of the 1970 Clean Air Act Amendments.

If anything the case is even more clear cut with regard to heavy duty vehicles. The 1977 Clean Air Act Amendments required that all heavy trucks (gasoline and diesel) meet emission standards for Nitrogen Oxides (NOx) roughly

equivalent in stringency to those required for cars. Congress intended that 1985 and later model year trucks achieve a 75% reduction in NOx from the levels emitted by uncontrolled gasoline trucks. Another section of the 1977 law also requires diesel particulate control. EPA had started to implement these provisions in 1980, issuing a Notice of Proposed Rulemaking (NPRM) for particulate and an Advanced Notice of Proposed Rulemaking (ANPRM) for NOx. However, no further progress occurred for four years until the environmental community, relying on the legislative requirement, forced EPA's hand in court. At that time, EPA was ordered by the Court to issue regulations by March 15, 1985. This action while much later than it should have been, would not have happened without a specific legislative mandate. Were the Administration proposal adopted in 1977, this court decision would not have been possible and we would be even further behind with regard to truck emissions reductions.

It is especially troubling that the Administration would propose to remove the legislative mandate just when it is beginning to have the desired impact. Within the past few months, we have seen Navistar announce that they have sufficiently developed technology to enable them to meet the 1991 and 1994 NOx and particulate standards. Cummins has announced their intention to begin offering buses in 1991 which they are optimistic can meet the 1991 bus requirements. And finally, Navistar has announced that they expect that they can achieve even greater NOx control in the post 1994 era. Eliminating the statutory mandate at this time would seem to undercut those who have responded to the need for control. How easy will it be to restore these efforts in the future without a legislative mandate?

S1630 would codify the 1991 and 1994 heavy duty vehicle particulate standards. Similarly, the 1991 diesel bus standards should also be included in the bill.

It is important to note that any engines unable to achieve stringent truck requirements could still be sold if non conformance penalties (NCP's) are paid by the manufacturer.

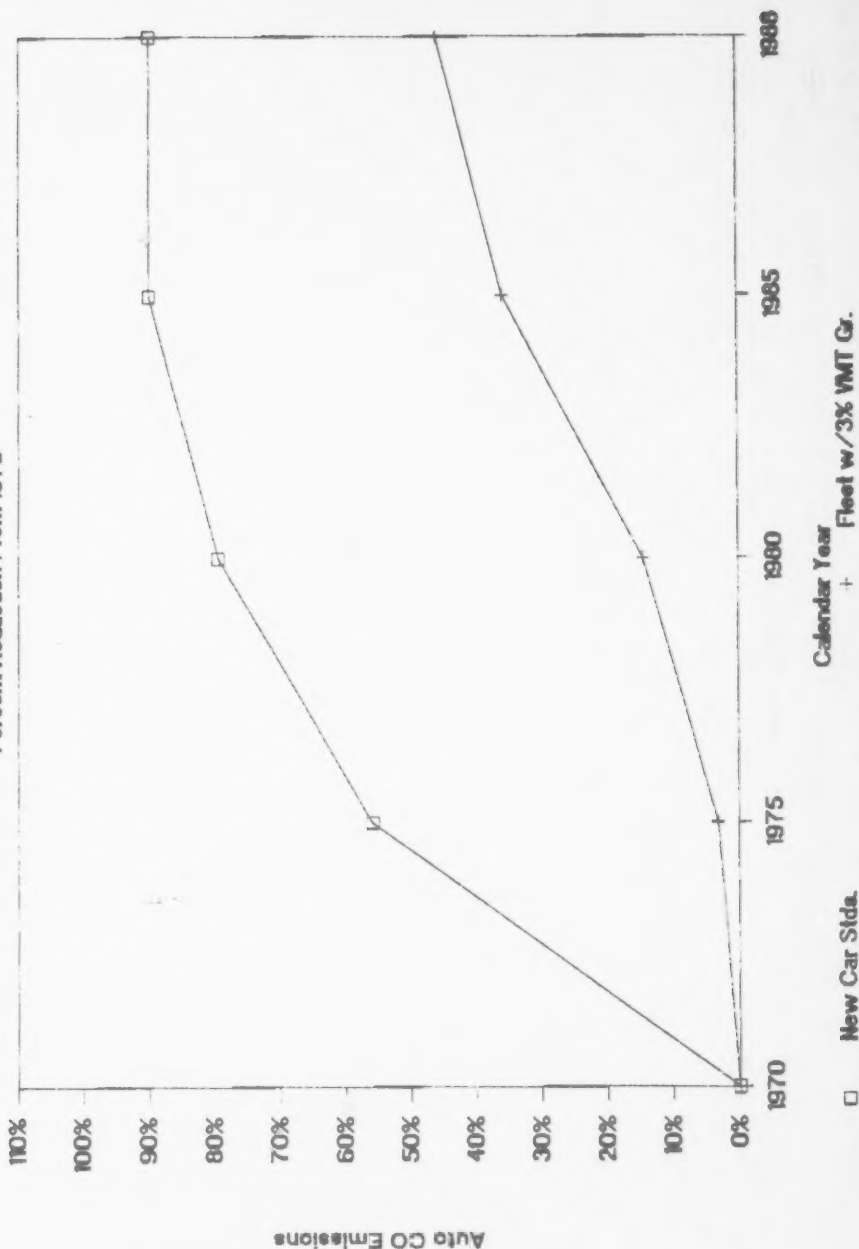
It is worth emphasizing the need to include tight standards in the law for urban buses. Urban buses are important well beyond their numbers for several reasons:

1. Urban buses tend to be used almost continuously in the most densely populated urban corridors where the greatest number of people are concentrated.
2. These vehicles are used in a stop and go driving pattern with high engine loading such that particulate emissions are much higher per mile driven compared to other mobile sources.

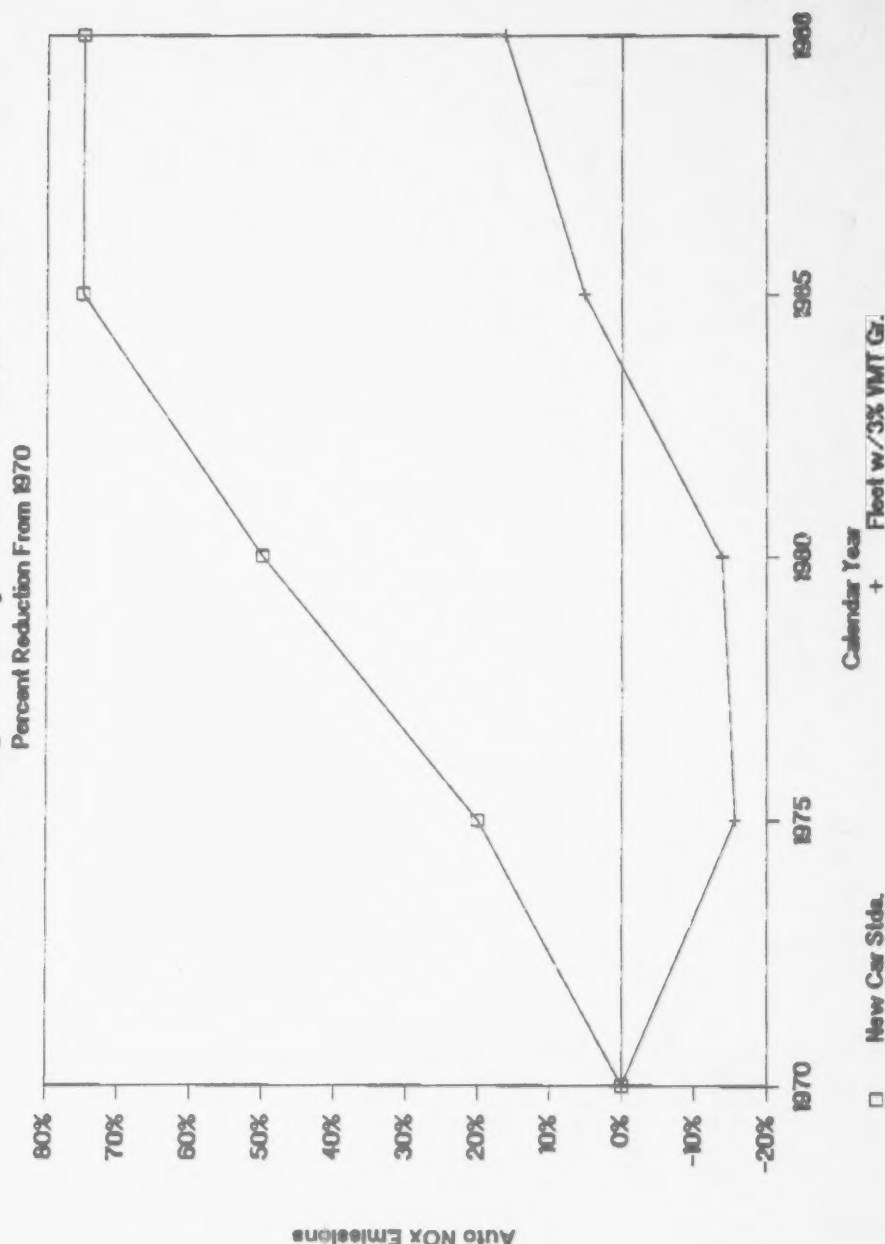
As a result public exposure to diesel particulate from these vehicles is very high.

Trends In Light Duty Vehicle Emissions

Percent Reduction From 1970



Trends In Light Duty Vehicle Emissions



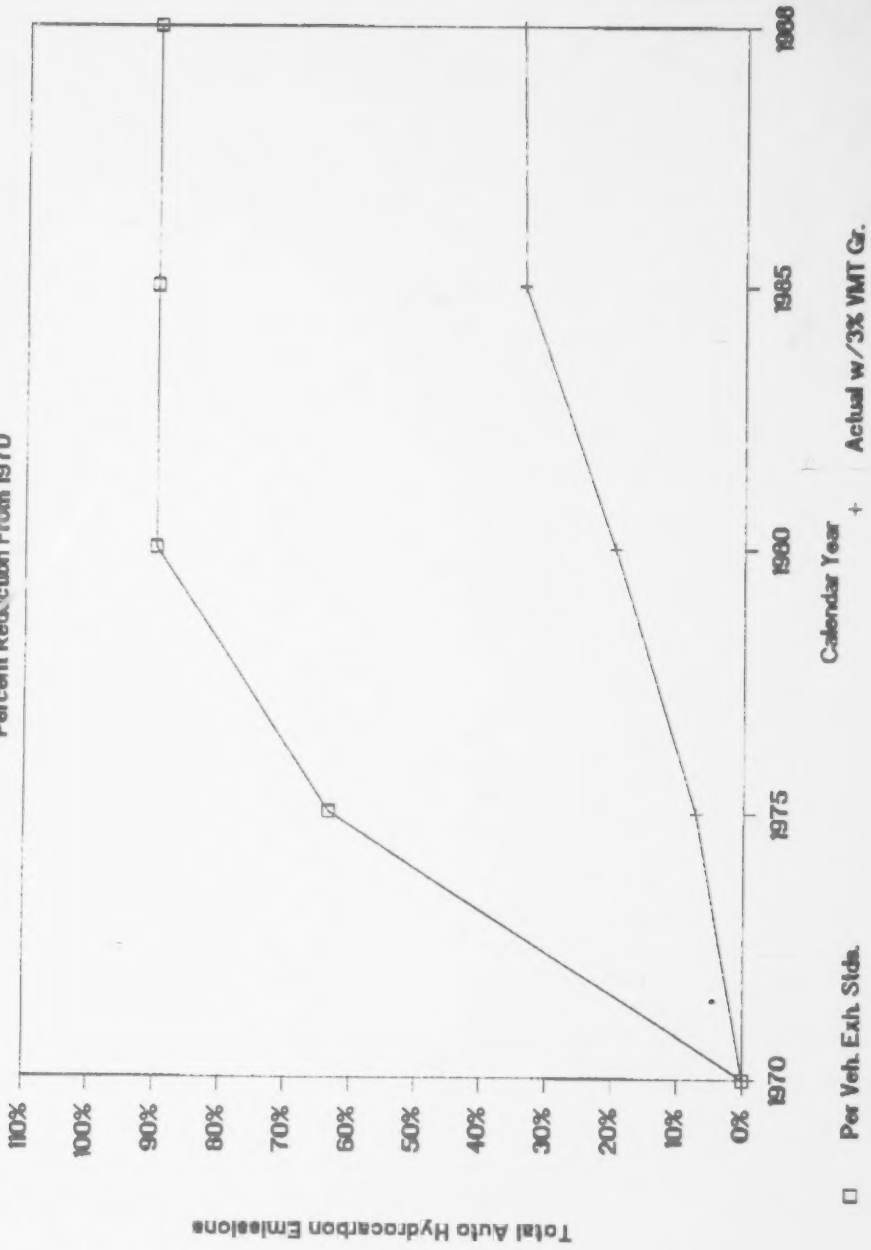
P. 2

***DC

OCT 30 '89 07:54

Trends In Light Duty Vehicle Emissions

Percent Reduction From 1970

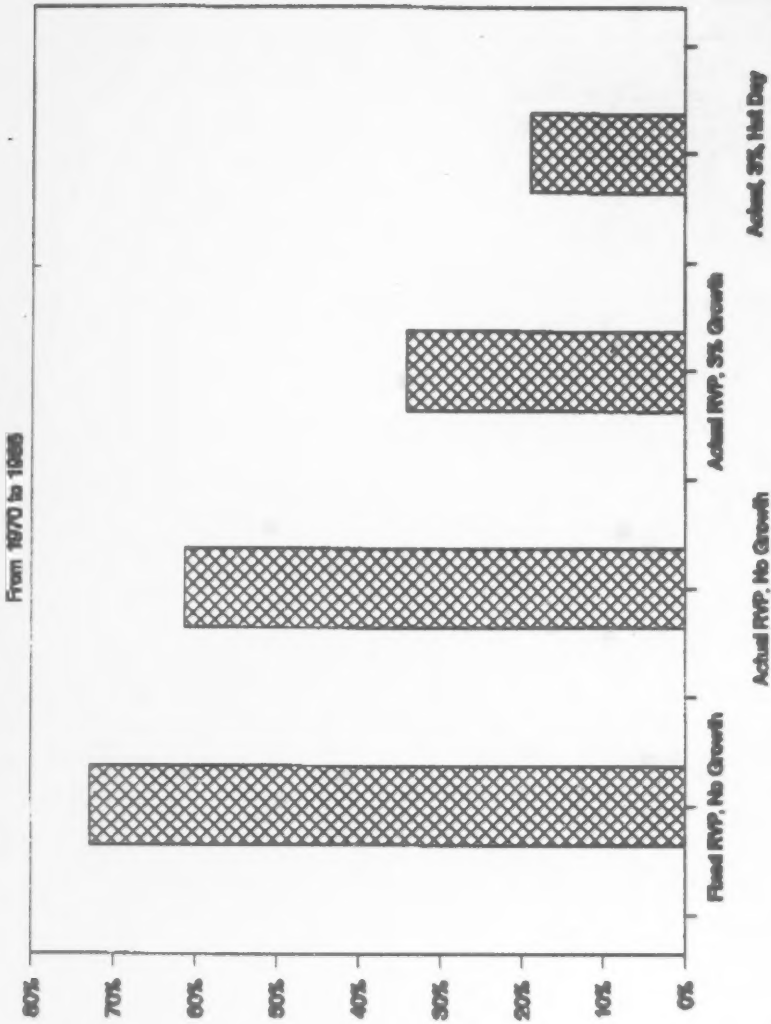


P. 8

***DC

OCT 30 '89 07:55

HC Emissions Reductions From Cars



OCT 30 '89 07:55 -- .**DC

TESTIMONY OF TOM CACKETTE
DEPUTY EXECUTIVE OFFICER
CALIFORNIA AIR RESOURCES BOARD

Mobile Source Provisions of S.1630

SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
SEPTEMBER 20, 1989

Thank you very much for inviting me to testify before you. I'm sure you all have "seen" Los Angeles' serious air pollution problem. Most every other city in California also suffers from unhealthy air, although fortunately not to the degree of Los Angeles. About one half of all emissions which cause California's air pollution come from motor vehicles. This is typical of many cities across the country.

Reducing emissions from motor vehicles has been at the center of our efforts to improve air quality. We were at it before there was a Clean Air Act, and the Congress graciously allowed us to continue this effort when it established federal motor vehicle emission control requirements in the 1970 amendments to the Act.

As a result we believe the entire country has benefited. California has led the way in establishing technology forcing emission standards for motor vehicles. Our standards resulted in the first crankcase controls, first NOx controls and first evaporative controls. Our standards also forced the development of the computer-controlled, catalytic equipped car of the 1980s. This car has much lower emissions while simultaneously achieving improved fuel economy and driveability. Although this technology has been in nationwide use throughout most of the 1980s, it is also the technology of the future. It holds the promise of further reductions in emissions, at a reasonable cost.

California is taking advantage of this technology to implement a new set of stringent emission controls for cars and trucks sold in our state. I hope you will find the following comparison of our efforts to the provisions of S.1630 helpful.

Cars and Light Trucks: Beginning last year, new cars and the lightest trucks sold in California were subject to a 0.4 gram per mile (g/mi) emission standard for NOx. S.1630 would impose this standard nationwide in 1993. The technology has been demonstrated; the cost is reasonable.

Earlier this year, we adopted a 0.25 g/mi NMHC tailpipe standard for cars and the lightest trucks, beginning with the 1993 model year. This is the same standard proposed in S.1630 for the 1993 model year. Again, we found the standard to be feasible and cost effective. For both the NMHC and NOx standards, we demonstrated there were models on the road today that meet these standards. There is no question in my mind that these standards can be met on a nationwide basis given the leadtime provided in this bill.

S.1630 also provides for a second phase of standards. In 1995, the compliance period for cars is extended from 50,000 miles to the vehicle's full life of 100,000 miles. California adopted this requirement earlier this year. Considering that 70 percent of a vehicle's emissions occurs beyond 50,000 miles, and that every other vehicle class is already required by EPA regulation to comply for its full life -- up to 290,000 miles in the case of a heavy truck -- a change to full life compliance for cars is needed.

S.1630 would halve again the NMHC and NOx emission standards for cars and the lightest trucks beginning in 2003; that's 13 years away. CARB has determined there is sufficient optimism in meeting a more stringent 0.2 g/mi NOx emission standard that we have committed in our State Implementation Plan (SIP) to adopt it for late 1990s models. We are also evaluating a new technology -- electrically heated catalysts -- that offers promise of compliance with a 0.125 g/mi NMHC tailpipe standard.

I can not tell you today that these second phase standards are feasible. But considering the tremendous potential for further improvements to current emission control technology -- improvements that have always occurred when we have required them --; considering the extremely low emissions of vehicles which are using the best emission controls --we have tested one model whose average in-use emissions at 40,000 miles were 0.11 g/mi NMHC --; and considering that more than a decade remains before compliance with these more stringent standards would be required, I can draw only one conclusion. If these standards are established in law,

1

there is a very good chance they will be met. If they are not established in law, they will likely not be met, except in California where we are committed to ensure all possible advances in emission control technology are applied.

The cost of compliance with more stringent standards is an important consideration in adopting new emission standards. We have assessed in detail the cost of meeting the 1993 standards set forth in S.1630. We estimate the cost of compliance to be under \$100 per vehicle. Although we are not able to precisely estimate the cost of the second stage standards, we offer a rough estimate of another \$100 per car. When comparing these costs to the lower emissions achieved, we conclude that both sets of standards are cost effective, especially when compared to the cost of applying a second or third wave of emission controls to industrial sources of pollution.

Heavy Trucks: EPA made a strong case for a 4.0 g/bhp-hr NOx standard for heavy trucks in its proposed rulemaking of 1985. Despite this, EPA adopted a less stringent standard of 5.0 g/bhp-hr. S.1630 would establish a 4.0 g/bhp-hr standard for 1994 models. This level of control is feasible, and needed in California where up to one half of the heavy duty truck traffic is trucks which are registered in other states, and thus subject to federal standards. A second phase standard of 2.0 g/bhp-hr would go into effect in 2003. Unless new technologies develop, which is possible in the time remaining, compliance with the 2.0 g/bhp-hr NOx standard will require the use of alternative fuels such as methanol or natural gas.

Other Vehicle Provisions: There are several other provisions of S.1630 which are innovative and feasible. One is on-vehicle diagnostics. It may seem like Star Wars for a car to actually determine as it drives whether it is exceeding emission standards, and if it is alert the owner that service is needed. The technology to do this is being demonstrated today. Just this month CARB adopted a regulation requiring this on-vehicle diagnostic capability on 1994 and newer models.

S.1630 would impose control requirements on off-road vehicles for the first time. The emission controls developed for on-road vehicles should be directly transferable to many off-road engines. The bill would also require EPA to evaluate requiring larger light trucks to comply with emission standards while

carrying a full payload. This would assure that emission controls remain functional and effective during a common mode of operation. (These trucks are currently tested without payload). CARB will be considering such a requirement next spring.

Fuels: California has required the use of low volatility gasoline during the smog season since the 1970s. S.1630 would impose this same requirement for most of the country. The bill would require the use of even lower volatility fuel in hot desert areas. We suggest the Administrator be given some discretion in establishing volatility requirements for these areas in order to avoid creating potential driveability problems for some cars.

As we strive to achieve lower emissions, the interaction between a car's emission controls and the fuel it uses becomes more important. S.1630 would require EPA to establish requirements for fuel quality. This could require the removal of harmful components such as benzene and lead, and the addition of beneficial additives such as detergents. The California Legislature has directed us to develop similar requirements by 1991.

Inspection and Maintenance: We believe strongly that the Act should establish performance standards for inspection and maintenance programs, and S.1630 does this by requiring each program to reduce emission by 4700 tons per year per million vehicles inspected. We suggest that additional specificity is required as to in which year these reductions must be achieved, and how they are to be calculated. These details will determine the feasibility of obtaining the mandated emission reductions.

Regardless of these details, we think it is imperative that states evaluate the effectiveness of their inspection and maintenance programs on an ongoing basis. As California has learned, realizing the full benefits of an inspection and maintenance program is a difficult task. Our first detailed assessment of our inspection and maintenance program revealed we were obtaining less than one half of the emission reductions we had expected. It also revealed how to double the emissions reductions at very little additional cost.

We expect that many state programs are doing no better than ours. Based on our experience, we recommend that all states with inspection programs be required to periodically evaluate the

actual emission reductions being achieved using analytical techniques to be developed by the EPA.



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STATEMENT

Of The

MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION

Before The

SENATE ENVIRONMENT AND PUBLIC WORKS COMMITTEE

SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION

HEARINGS ON S. 1630

September 28, 1989

I. INTRODUCTION

The Manufacturers of Emission Controls Association (MECA) is pleased to present testimony to the Senate Subcommittee on Environmental Protection on S. 1630. We commend the Subcommittee for its efforts to address the serious air pollution problems currently confronting this nation. Legislation eventually passed by this Congress reauthorizing the Clean Air Act will establish the framework for the control programs that will determine the quality of the air we breathe well into the next century.

MECA is a non-profit association of companies that manufacture various motor vehicle exhaust emission controls. Our membership includes companies with extensive experience and a proven track record in the development and application of catalytic converter and diesel particulate trap oxidizer technology.

The United States mobile source emission control program created in 1970, when Congress established technology-forcing standards which fostered the development of new technology, is the most successful air quality control program in the world. Motor vehicles on the road today emit substantially less pollution than vehicles of the 1960's. At the same time, fuel economy has nearly doubled, and vehicle performance has not suffered. Our companies are proud of the role they played in making the control program a

SUCCESS.

This pride in our past contributions, however, does not keep us from recognizing that the issue before the Subcommittee is not which sources have or have not controlled emissions in the past, but what reductions can be achieved from all sources -- stationary and mobile --to help address this nation's serious air quality problems. It is in that spirit that our companies continue their efforts to develop and refine emission control technologies and in which we offer the comments presented today.

II. SUMMARY

- o We believe that with further development, refinement, optimization, and utilization of emission control technologies, either existing or under development, passenger car standards of 0.25 NMHC, 3.4 CO and 0.4 NO_x are technologically achievable for 100,000 miles.

- o While the technological challenges in meeting the second-phase passenger car standards of 0.125 HC, 1.7 CO and 0.2 NO_x are considerable, the past accomplishments in emission control, the pace of technological developments, expected improvements in fuel and oil quality, and well over a decade of lead time to develop and apply technological solutions suggests that meeting these levels by the year 2003 is not beyond reach

technologically.

- o Proper vehicle maintenance is an important element in insuring that vehicles designed and built to meet emissions standards actually achieve those levels of control in use. Improvements in the in-use compliance program such as strengthened state I/M emission testing, expanded anti-tampering inspections, and prohibitions against tampering and misfueling all would help insure that vehicles are maintained, that emission control components are protected, and in-use emissions are reduced.
- o Emission averaging to determine compliance with emission standards would constitute a major departure from the very core of the U.S. motor vehicle program and would pose a serious threat to the effectiveness of that program. We believe averaging, even with individual engine family emission limits, would allow greater emissions than under a standard where every vehicle must comply. In addition, averaging would discourage, rather than encourage technological developments and make in-use enforcement extremely difficult.
- o Tremendous progress has been made in developing and applying diesel particulate control technology to trucks and buses. For example, one of our members recently

announced that it intends to offer a diesel particulate trap system that will enable buses to meet the 1991 particulate standard. We are concerned that, at the very moment the technological solutions to cleaning up diesel emissions are close at hand, EPA is contemplating a three-year delay in implementing the bus standard.

- o We recognize that tighter emission standards and other provisions in S. 1630 which will strengthen the motor vehicle program will create new engineering challenges for the motor vehicle industry of which we are a part. But, history has shown that the most effective way to insure that needed technology development occurs is to establish fixed standards with provision for reasonable lead time. Our members are prepared to do everything they can to help insure that if more stringent standards are set, they will be met.

III. PHASE I GASEOUS EMISSION STANDARDS FOR PASSENGER CARS

Technological Feasibility of First Phase Standards.

S. 1630 would, as an initial step, tighten the existing passenger car standard for HC to a 0.25 gpm NMHC standard and the existing NOx standard to 0.4 gpm. We believe that with further development, refinement, optimization, and utilization of emission

control technologies, either existing or under development, such standards would be technologically over the 100,000 miles useful life of the vehicle. As noted above, the technical solution would not simply be a better catalyst, but rather a complete system with advanced catalyst designs and improved engine controls such as multi-point fuel injection and quick responding closed loop control of air/fuel metering.

One indication of the technological feasibility of these proposed standards is that California is already implementing a 0.4 gpm NO_x standard which is currently being phased in over the next several model years. Earlier this summer, California adopted a 0.25 NMHC and a 3.4 CO standard for passenger cars and light trucks. EPA and California certification test results, which are based on 50,000 miles durability aging, also illustrate that progress in reducing emissions is already taking place. For example, the California Air Resources Board staff reported recently that 65 percent of the 1988 model passenger cars (and light-light duty trucks) certified at or below a 0.25 non-methane hydrocarbon, 3.4 CO and 0.4 NO_x level. Nationally, even as early as the 1987 model year, approximately 50 percent of the engine families certified below a .25 HC, 3.4 CO, and .4 NO_x level, and emission levels for the 1988 and 1989 model years are even lower. It should be kept in mind in considering the certification data that manufacturers typically engineer systems to ensure that vehicles in certification meet standards by a comfortable margin. Nevertheless, the certification test results provide an important

indication of what is already being achieved under the current standards.

A number of promising approaches have been, or are being developed, which could achieve greater NO_x and HC control than currently required. For example, several of our companies have developed, or are developing and testing, advanced catalyst formulations with enhanced control efficiency and durability characteristics. New generation three-way catalysts, for example, feature open porous surfaces more resistant to performance deterioration and incorporate materials which enhance the active catalyst performance.

Since the key to greater HC and CO control is to maximize emission control during "cold start", a major focus of our member companies' engineering efforts has been in developing catalyst formulations and substrates for use in a close coupled position as light-off converters where operating temperatures will be higher than experienced in the current underbody position. Our companies are also developing catalyst formulations which are more active at lower temperatures to improve emission control performance of converters located in the underbody position.

Proper performance of the catalyst is dependent on the system in which it operates. Three-way catalysts will operate more efficiently in the exhaust of a tightly controlled air/fuel metering system. Multi-point fuel injection, improved ignition

systems, computerized engine controls, improved oxygen sensors, and better air flow management, which increasingly are being used, will help maximize catalyst efficiency and durability and facilitate compliance with the proposed standards.

We believe that the advances in catalyst designs and other improvements in the overall emission control systems being applied today primarily for use in passenger cars can be applied to other classes and categories of motor vehicles as well.

Durability.

The most serious engineering challenge to meeting more stringent emission standards is to maintain emission control performance during the useful life of the vehicle under real-world operating conditions. We believe any remaining engineering challenges can be addressed. But, for the emission control systems to perform effectively, the vehicles should be properly maintained.

For the catalytic converter, the primary engineering challenge is maintaining conversion efficiency in a hostile environment in which the catalyst is sometimes subjected to extremely high exhaust temperatures as well as exposed to contaminants from the fuel (e.g., lead) and oil (e.g., ash). Substantial advances in catalyst design have been made since catalytic converters were first introduced in 1975; indeed many of

the catalyst designs found on 1989 model year vehicles are superior to those found on vehicles sold in the early 1980's.

Our companies have developed, and are continuing to develop, improved catalyst supports (substrates), washcoats, and catalyst formulations which are better able to withstand exposure to the extremely high temperatures sometimes experienced in vehicle operation. For example, work is continuing to develop catalyst substrates with greater resistance to melting than the material used in the majority of today's catalytic converters. Also, companies have developed and are working on new washcoat materials that are more resistant to sintering at high temperatures.

Work is also under way to make catalyst systems more resistant to contamination. For example, research is taking place to develop washcoat materials with better porosity and to develop methods of chemically bonding the contaminants such that they do not effectively poison the precious metal active sites.

Other developments are occurring which should improve in-use catalyst performance. First, as noted above, improvements to the fuel control and ignition systems will better regulate the engine operating conditions permitting the catalyst to function in a more controlled environment, thereby improving catalyst performance. Other engine improvements help reduce engine emissions generated by malfunctions. Second, and very important, the level of the principal contaminate contributing to catalyst deterioration in-

use -- lead -- has, over the last several years, significantly decreased in unleaded gasoline. Such reductions in trace lead levels in unleaded gasoline have had an extremely positive impact on increasing catalyst durability. As lead contamination levels in unleaded gasoline continue to go down, catalyst durability will continue to improve. Indeed, the proposed ban contained in S. 1630 on the sale of leaded gasoline beginning January 1, 1991 would quickly and completely eliminate lead contamination of unleaded gasoline. Also, oil companies are working with motor vehicle manufacturers to improve fuel additive packages which are designed to reduce fuel injector fouling and will thus enhance emission control system durability. The requirement in S. 1630 that EPA set specifications for fuel quality will facilitate the introduction of gasoline fuels and additives that will better enable motor vehicles to meet more stringent emission standards.

In discussing the technological issues relating to meeting more stringent emission standards under real world conditions, we have not attempted to address the policy issues this subcommittee will consider in defining the scope and duration of the motor vehicle manufacturer's warranty.

Lead Time.

As our members are involved in the development of only part (albeit an important part) of the complete control systems that would be used to meet more stringent standards, we will not

attempt to predict the precise model year in which the motor vehicle manufacturers would be able to fully optimize and apply control systems to meet the proposed standards. In an effort to be responsive on this issue, however, we can offer several general observations.

First, as mentioned above, several of our members are engaged in a number of development efforts to continue to improve catalyst technology (formulations, washcoats and substrates). These members are optimistic that these improved catalyst technologies will be demonstrated effective, as part of an integrated control system, and be available for use within the lead time provided by S. 1630.

Second, we do not believe the technological advances needed to meet the proposed 0.25 NMHC and 0.4 NO_x standards -- which will involve the further development, refinement and optimization of control technologies either existing or under development -- requires the same magnitude of technological advance that was necessary when the automobile industry went from non-catalyst to catalyst equipped cars within five years from the time Congress adopted technology-forcing standards in 1970. While the standards themselves were modified on several occasions, the fact remains that the auto industry began equipping catalytic converters -- a radically new technology at the time -- in a relatively short period of time. We cite this history because we believe it is illustrative of the manner and speed with which the auto industry,

of which we are proud to be a part, can respond with significant technological solutions when emission control requirements have been established.

IV. PHASE II GASEOUS EMISSION STANDARDS FOR PASSENGER CARS

S. 1630 calls for a further tightening of passenger car and light duty truck standards (0.125 gpm HC, 1.7 gpm CO, and 0.2 gpm NOx) beginning with model year 2003.

Meeting the standards proposed by S. 1630 for model year 2003 likely will require even greater control of cold start CO and HC emissions, and more durable catalysts and control systems. The technological solution will likely involve the further optimization and utilization of the control technologies used to meet the initial standards contained in S. 1630. Cleaner gasoline fuel such as the "reformulated gasolines" currently being elevated and developed by the oil industry, as well as cleaner oils would greatly facilitate compliance with the Tier II standards. On-board diagnostic controls, such as those covered by regulations adopted this month by the California Air Resources Board, would also help achieve such levels over the useful life of the vehicle. For example, certain diagnostic controls will identify engine malfunctions which if left unattended could damage the catalyst. By identifying the problem and having the problem fixed before catalyst is damaged, catalyst durability can be maintained.

While the technological challenges in meeting the Tier II standards are considerable, the past accomplishments in emission control, the pace of current technological developments, and well over a decade in lead time to develop technological solutions suggest that meeting these levels by the year 2003 is not beyond reach technologically.

If Congress determines that protection of the public health and welfare necessitates emission control to the levels called for in S. 1630, prior experience has shown that the best way to insure that needed technology is developed is to establish specific standards and provide adequate lead time for the motor vehicle industry to respond.

V. CONTROLLING EMISSIONS IN USE

Existing emission standards have resulted in significant reductions in emissions in use. Indeed, each time emission standards were tightened, emission levels in use have been reduced.

Nevertheless, some vehicles for a variety of reasons are exceeding one or more of the emission standards for which they were designed to meet. For example, a vehicle with a poor operating engine and inoperative emission controls can emit over 10 times the pollution of a vehicle with a well-maintained engine and a functioning emission control system.

Improving in-use emission control programs as called for by legislation before this subcommittee would have a direct and major impact on air quality. Provisions in S. 1630 calling for a strengthening of existing state operated I/M emission test programs, expanding the use of emission control equipment inspection programs, and prohibiting individual car owners from misfueling, all would reduce in-use emissions from existing vehicles. These programs would have a second benefit. As noted above, to maximize the effectiveness of the advanced control systems designed to meet new, more stringent standards, proper fueling, maintenance and operation of these vehicles by the consumer will be vitally important. Strengthened in-use programs would facilitate compliance with more stringent standards by providing added incentives to vehicle operators to properly fuel, maintain and use their vehicles, thereby better protecting the emission control system.

VI. AVERAGING TO DETERMINE COMPLIANCE

S. 1630 would prohibit the use of averaging to determine compliance with emission standards. We believe emission averaging constitutes a major departure from the structure and philosophy of the existing motor vehicle program and poses a serious threat to the effectiveness of that program.

We believe an "averaged" standard allows for greater

emissions than a standard under which every vehicle must comply. Currently, vehicles are designed and certified such that taking into consideration production variability the highest polluting vehicle manufactured will still meet the standard. Thus, every car built should emit at or well below the applicable standard. With averaging, some cars can be designed and built to emit above the standard as long as the fleet on average meets the applicable standard. Clearly, greater emission reductions will occur if every car is built to meet the standards, as currently required by the Clean Air Act, than if only some of the cars meet the standards.

Engine family averaging, which requires each vehicle to meet some emission limit (i.e., the engine family emission limit), eliminates some, but by no means all, of the shortcomings of emission averaging. Currently, vehicles in certain engine families are controlling emissions well below the applicable standard. Engine family averaging creates an incentive to take "paper credits" for such emission reductions which would have occurred in any event and use them to certify other engine families above the applicable emission standards. The use of emission banking and trading, which would be permitted under the President's proposal, will only add to the shortcomings of averaging.

If tighter emission standards were adopted, but engine

family averaging were permitted, including trading and banking of emission credits, we believe it would be possible to equip vehicles in some engine families with less sophisticated emission control equipment than currently are used to meet the existing standards. This could occur because a manufacturer could accumulate sufficient emission credits to enable it to select an engine family emission limit for a particular engine family above the current standards and sufficiently lenient to allow the use of less sophisticated control systems.

In addition, rather than encourage innovation, we believe averaging will discourage research and development efforts by emission control manufacturers because averaging, particularly combined with trading and banking, creates substantial uncertainties regarding what the market will be for a given technology. The emission control industry made substantial research and capital investments after passage of the 1970 Clean Air Act because Congress established specific standards which created regulatory certainty that a need for control products, once developed, would exist. With averaging, trading, and banking that certainty is eliminated.

Finally, we believe that in-use enforcement of the emission standards, particularly with regard to recall, inspection and maintenance programs, and emissions warranties under an averaging scheme will be difficult if not impossible. An averaging scheme under which individual vehicles need not meet a specific emission

level is completely inconsistent with the existing motor vehicle in-use compliance program -- a compliance program which has demonstrated its effectiveness over the past two decades. Recall, warranties, and I/M inspections are all based on evaluating (and requiring the manufacturer to correct if necessary) individual vehicle emission control performance.

While engine family averaging at least provides an emission limit against which individual vehicle performance can be evaluated, such a scheme would still hamper the effectiveness of the in-use compliance program. Averaging, particularly with trading and banking, will be a complex program to administer and enforce, placing a strain on EPA financial and human resources which already are generally acknowledged to be below the levels needed to effectively enforce the mobile source program. Faced with a full range of engine family emission limits, we believe recall, warranty protection, and I/M programs will become more difficult to administer.

VII. DIESEL PARTICULATE EMISSION CONTROL

S. 1630 would establish diesel particulate emission control requirements for various classes of motor vehicles. Our members, working with motor vehicle and engine manufacturers, as well as others, are developing and applying diesel particulate filters (trap oxidizers) and catalytic converter technology to control particulate emissions from both highway and off-highway vehicles.

One of our member companies recently announced that it intends to offer trap oxidizer systems which will enable diesel powered buses to meet the 1991 0.1 g/BHP-hr particulate standard. This technological breakthrough proves once again that technology forcing standards work and is illustrative of the tremendous progress which has recently occurred in diesel particulate control technology in this country and around the world.

We are concerned, however, that at the very moment at which the technological solutions to cleaning up diesel emissions is close at hand, EPA is contemplating a three-year delay of the 1991 bus standard. We believe that a three-year delay is unwarranted, sends the wrong message to engine manufacturers and control system manufacturers who are working to develop control systems, and will result in needless excess particulate emissions in our nation's cities.

The provision in S. 1630 to limit the sulfur content of diesel fuel would not only help reduce emissions from diesel-powered vehicles, but would greatly facilitate the application of catalyzed trap oxidizers and catalytic converters to diesel powered vehicles. Precious metal catalysts which are used in catalytic converters and some trap oxidizer designs will oxidize SO_2 to SO_3 and the rate of the conversion is dependent on the activity of the catalyst formulation. Several of our member companies have developed or are developing catalyst formulations which convert much lower percentages of SO_2 to SO_3 . The fact

remains, however, that the catalyst formulations which are the most effective for emission control purposes are also the most effective in oxidizing SO_2 . Indeed, the lower the sulfur level in fuel, the greater the flexibility in selecting the best catalyst formulations.

VIII. EMISSION CONTROL OF ALTERNATIVE FUELED VEHICLES

S. 1630 would require EPA to establish emission standards for alternative fueled vehicles. We believe alternative fuels will play a role in addressing our air quality problems and in meeting our energy needs. Indeed, a number of our member companies are currently engaged in development programs to optimize catalytic converter technology for alternative fueled vehicle application. But we also believe that gasoline and diesel fuel will play a key role in fueling our nation's transportation system in this century and beyond. Consequently, we believe emission control requirements should be established such that all the various different fueled vehicles may compete fairly in the marketplace.

IX. EMISSION CONTROL OF OFF-HIGHWAY VEHICLES AND ENGINES

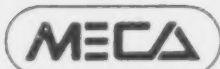
Under S. 1630, EPA would be required to establish emission standards for off-highway vehicles and engines. Several of our member companies are applying control technology -- most notably oxidation catalytic converters and, more recently, diesel particulate trap oxidizers to off-highway engines. These control

devices are being equipped on many varieties of off-highway vehicles in commercial operation around the world, and our companies are working to further develop and optimize these controls for even greater application.

X. CONCLUSION

MECA member companies are involved in a part of the development, production, and optimization of complete control systems for motor vehicles. Although we work with other suppliers and vehicle manufacturers on other aspects of control systems beyond those we actually produce, we have limited our comments to the areas within our particular expertise.

We fully recognize tighter emission standards will create new engineering challenges to develop and optimize motor vehicle emission control technology. However, our members have extensive experience with emission control technology and these companies would not be currently engaged in research and development of new products capable of greater control, if they did not have the confidence that those challenges can be met. The most effective way to ensure that the control systems necessary to achieve the desired emission reductions will be available is to have fixed standards in place with provision for reasonable lead time. Our member companies are prepared to do everything they can to help ensure that if more stringent standards are set, they will be met.



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May 5, 1989

Mr. Don Clay
Acting Assistant Administration
for Air and Radiation
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Dear Mr. Clay:

Re: Draft Report on Feasibility and Cost-
Effectiveness of Controlling Emissions from Diesel
Engines in Rail, Marine, Construction Equipment,
and Other Mobile Off-Highway Equipment, A-88-23

The Manufacturers of Emission Controls Association (MECA) is please to provide comments on the above-referenced study. MECA is a non-profit association of manufacturers of emission controls for mobile and stationary sources. Our members have over two decades of experience in developing and manufacturing emission controls and collectively have spent hundreds of millions of dollars on research and development. In recent years a number of our companies have turned their attention to applying control technology -- most notably oxidation catalytic converters and diesel particulate trap oxidizers -- to off-highway engine application.

The Radian study is a comprehensive "first look" examination of emissions from and emission control of off-highway vehicles and will no doubt be extremely helpful to Congress and EPA in fashioning a regulatory response to controlling emissions from these sources. We concur with the study's basic conclusions that catalytic converters and diesel particulate trap oxidizers can be applied to a variety of off-highway engine sources and result in significant emission reductions. We also agree that further development work is need to optimize and apply these control technologies to various classes of off-highway vehicles.

We believe, however, that application of catalytic converters to control carbon monoxide and hydrocarbons and the utilization of diesel particulate trap oxidizers could occur more rapidly than is suggested in the study. In fact, as is discussed below, catalytic converters and diesel trap oxidizers are currently being equipped on several varieties of off-highway

vehicles in commercial operation. In some applications, catalytic converters have been used for over 20 years. These devices are being used on vehicles operated in underground or in other enclosed environments to address odor and occupational health concerns.

Sulfur Content of Diesel Fuel

We concur with the report's conclusion that low sulfur fuel will facilitate the application of catalytic converters and catalyzed trap oxidizers to off-highway vehicles. Precious metal catalysts, which are used in catalytic converters and some trap oxidizer designs, will oxidize SO_2 to SO_3 and the rate of the conversion is dependent on the activity of the catalyst formulation. Several of our member companies have developed and are developing catalyst formulations which convert much lower percentages of SO_2 to SO_3 . The fact remains, however, that the catalyst formulations which are the most effective in oxidizing hydrocarbons and carbon monoxide are also the most effective in oxidizing SO_2 . Low sulfur fuel will allow greater flexibility in the selection of catalyst formulations which will result in more effective control systems.

Locomotives

We concur with the study's conclusion that exhaust aftertreatment controls can be used in locomotive application. In fact, diesel trap oxidizers and catalytic converters are both currently being used on this type vehicle.

Catalytic converters have been used on small locomotives (up to 1000 horsepower) operating in mine and tunnels for over 20 years. For example, they are being used on locomotives operating in the underground portions of the New York City subway system where the locomotives (typically equipped with Caterpillar 3406 TA engines) are used in track maintenance operations. The converters are equipped to control oxygenated hydrocarbons for odor control and carbon monoxide to protect the workers' health. Worldwide nearly 1000 converters have been equipped on locomotives.

Typically, the converters control 50 to 90% of the HC emissions, depending on exhaust temperature, and 90% or more of the CO emissions. Converters in this application have lasted up to 10,000 hours of operation.

Increasing concern about smoke, odor, and diesel particulate emissions has resulted in growing interest in the application of trap oxidizers to locomotives. Currently, there are approximately 10 locomotives equipped with traps which are being evaluated. For example, a locomotive with a main drive Cummins V1710 P525B, 12 cylinder engine, 1710 cubic inch, 525 horsepower engine has been equipped with a trap which has reduced smoke opacity to below 2 percent and significantly reduced the odor.

Marine Vessels

We believe it is technologically feasible to equip exhaust aftertreatment on larger, commercial type marine vehicles. The study mentions that safety considerations would preclude the application aftertreatment controls from marine vehicles. We believe control systems can be developed for this application that would address any special safety considerations attendant to marine application.

While to our knowledge no marine vessels have yet been equipped with aftertreatment controls, we understand that there is interest in one of the Canadian Provinces in retrofitting trap oxidizers on certain commercial marine vessels.

Farm Equipment

We concur with the author that farm equipment could be readily equipped with exhaust aftertreatment controls. Catalytic converters have been equipped on gasoline powered farm tractors operated in underground mushroom farms for over 10 years.

In Canada, several hundred diesel powered, farm-type tractors used in underground mining have been equipped with catalytic converters. In the United States, Canada and Europe diesel-powered tractors are being tested with trap oxidizers.

Construction Equipment

As the study notes, the high-load operating regime of construction equipment will create a favorable operating condition to facilitate trap oxidizer regeneration and makes this class of vehicles excellent candidates for aftertreatment controls.

Catalytic converters have been equipped on certain varieties of construction equipment over the past 20 years. For example, catalytic converters, worldwide, have been equipped on hundreds of skid-steer loaders. At one location in the U.S. where a large manufacturing assembly plant is being constructed, all diesel powered construction equipment (cranes, welders and compressors) has been equipped with catalytic converters.

Recently, trap oxidizers have been equipped on a variety of underground mobile mine equipment and on equipment operated in enclosed areas where particulate exhaust poses a direct threat to worker health. To date, over 100 traps have been installed in new and retrofit application. These devices have achieved up to, and in some cases, over 90 percent particulate reduction. Despite the harsh and rugged operating environment, these devices have demonstrated outstanding durability. For example, a significant portion of the traps installed on mining equipment have operated for over 5000 hours without requiring replacement.

A transient emission test cycle, developed as part of a joint U.S./Canada program by Michigan Tech University for evaluating the emission performance of mining equipment (a copy will be forwarded under separate cover), might serve as the basis for developing an emission test cycle for other types of construction equipment.

Mechanical Handling

Mechanical handling equipment, primarily fork lift trucks, is another source of off-highway vehicle emissions. While the vast majority of these vehicles are powered with propane, a growing number of vehicles are diesel powered. Catalytic converters have been installed on diesel powered fork lifts for over 10 years with service lives reaching 10,000 hours. Recently, traps have been equipped on a limited number of these vehicles.

Conclusion

Oxidation catalytic converters and diesel particulate trap oxidizers can provide significant emission reductions in off-highway application. While further development and optimization work is needed to apply these technologies to certain off-highway applications, converters and trap oxidizers are currently being used in some commercial off-highway application and can be made available for other applications in the very near future.

If you have any questions or if we can be of assistance, please call me.

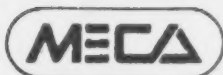
Sincerely,



Bruce I. Bertelsen
Executive Director

BIB/cg

cc: Tim Sprik
Central Station, Docket No. A-88-23



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October 30, 1989

Senator Max S. Baucus
Chairman
Subcommittee on Environmental Protection
U.S. Senate
458 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Senator Baucus:

The Manufacturers of Emission Controls Association is pleased to respond to your questions concerning motor vehicle emission control technology. Your questions and our responses are set out below.

Question 1: In your industry how much money is devoted each year to research and development for refinement and development of new technologies to control emissions?

Answer 1: We do not have available figures for research and development expenditures on a per year basis. However, during the period 1975 to 1989 our member companies spent collectively over \$250 million on research and development of motor vehicle emission control equipment. Between now and the end of year 2000 our companies expect to spend an additional \$200 million.

At the Hearing information was requested concerning the export of U.S. motor vehicle emission control technology to other countries. U.S. manufacturers are recognized world leaders in developing and producing motor vehicle emission control equipment. American companies got the jump in developing motor vehicle emission controls because the United States led the rest of the world in requiring the clean-up of pollution from cars and trucks. As a growing number of countries begin to require the control of motor vehicle emissions, U.S. companies will be active participants in the market.

Our member companies estimate that from 1975 to 1989 the total export value of their motor vehicle emission control products was nearly \$1 billion. Between now and the year 2000 our member companies estimate additional exports of over \$3 billion.

Question 2: ARCO and other companies have been working on reformulation of gasoline. What effect does this have on your work? Is it easier to design emission controls to meet tougher standards with reformulated gasoline?

Answer 2: Since work on developing reformulated gasoline is just getting underway, it is difficult to comment on specific emission control effects. Generally, we believe reformulated gasoline will be beneficial in reducing emissions and facilitating the effective use of catalyst technologies. For example, if reformulated gasoline reduces or eliminates the sulfur content in gasoline, catalyst performance would improve.

Question 3: The Senate bill requires that automakers install on-board computer systems designed to detect malfunctions in the car. What effect does this have on your ability to design effective emission control systems?

Answer 3: We believe on-board diagnostic systems will be very beneficial in reducing excess emissions in-use and in optimizing control technologies. With regard to catalytic converter technology, to the extent on-board diagnostic systems can identify engine malfunctions before the catalyst is damaged, catalyst durability would be enhanced. Second, information collected from on-board diagnostic equipment may provide insights which will better enable catalyst manufacturers to design catalyst to withstand certain abnormal in-use conditions.

Question 4: One of the concerns with methanol as an alternative fuel is the emissions of formaldehyde. EPA has concluded that the technology is available to control these emissions. Do you agree with this conclusion?

Answer 4: We believe catalyst technology will play an important role in controlling emissions from alternative fueled vehicles. In fact, several of our companies are currently working to optimize catalyst technology for application to alternative fueled vehicles. Development testing has demonstrated the ability of catalysts to control over 95 percent of the formaldehyde emissions. The primary focus is on systems development efforts to maximize formaldehyde emission control at cold start and in very cold environments.

Question 5: The auto makers have expressed concerns about the safety and durability of cars which are required to comply with emission standards for 100,000 miles. What is your view of this concern?

Answer 5: As we stated in our testimony, we believe emission control systems can be designed and built to meet standards for 100,000 miles. The most serious engineering challenge to meeting more stringent standards is to maintain

emission control performance during that period under real-world conditions. We believe improved and more durable catalysts, improvements in engine controls, improved fuel additive packages to reduce fuel injector fouling, on-board diagnostics and especially cleaner, completely lead-free gasoline all will help meet this challenge. In addition, good maintenance by the vehicle owner is important. The proposed improvements contained in S. 1630 to the in-use compliance such as enhanced I/M testing programs should help create added incentives to properly maintain and use vehicles.

Question 6: Do you agree with the testimony of the Engine Manufacturers Association that legislating specific statutory emission standards ignores the technological feasibility and trade-off issues inherent in controlling emissions and that standard setting should be left to EPA through rulemaking?

Answer 6: Prior history of the motor vehicle emission control program has shown that the greatest advances in emission control have occurred where Congress has established specific emission control requirements in the Clean Air Act. In contrast, the failure of the U.S. Environmental Protection Agency during the 1980s to carry out its administrative responsibilities in a timely fashion and set the emission control requirements for heavy-duty vehicles on the schedule established by Congress, has delayed the development and utilization of control technologies.

The specter that EPA may, through administrative action, relax the 1991 0.1 g/BHP-hr particulate standard for urban buses for three years has created significant uncertainty in the emission control industry. As we noted in our testimony, at the very moment the technological solutions to cleaning up diesel emissions are close at hand, a three year delay is unwarranted and sends precisely the wrong message to engine and control system manufacturers who are working to develop emission control systems.

Question 7: Do you agree with the Engine Manufacturers Association that a reduction in NOx levels for heavy duty engines jeopardizes the manufacturer's ability to meet the 1991 [sic] particulate level?

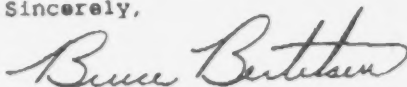
Answer 7: EMA in its testimony expressed concern with the technological feasibility of meeting simultaneously the 0.1 g/BHP-hr particulate standard for heavy duty engines and the 4.0 g/BHP-hr NOx standard S. 1630 proposed for 1994 and later model year heavy-duty engines. As we stated in our testimony, we believe the 0.1 g/BHP-hr particulate standard is achievable through a combination of engine design modifications and aftertreatment control technology. The traditional aftertreatment technique for controlling NOx emissions for gasoline powered vehicles, reduction catalysis, is not readily

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applicable to diesel powered trucks and buses because of the inherent lean exhaust gas. Therefore, NOx control for diesel trucks and buses is expected to be achieved through EGR and engine design modifications which are not within the scope of MECA member companies' technology development efforts. We do note that to the extent there is a NOx/particulate trade-off issue involved, the use of exhaust aftertreatment technology, such as the trap oxidizer which does not increase NOx emissions, to control particulates to below the 0.1 level should give the engine manufacturers added flexibility to pursue NOx control strategies.

We hope this information is helpful to the Committee. If we can be of further assistance to you, other members of the Committee, or the staff, please call me.

Sincerely,



Bruce I. Bertelsen
Executive Director

STATEMENT
ON BEHALF OF THE

AUTOMOTIVE SERVICE ASSOCIATION, INC.
AUTOMOTIVE PARTS AND ACCESSORIES ASSOCIATION
AUTOMOTIVE WAREHOUSE DISTRIBUTORS ASSOCIATION
SPECIALTY EQUIPMENT MARKET ASSOCIATION

BEFORE THE
U.S. SENATE ENVIRONMENT AND PUBLIC WORKS COMMITTEE

BY
DONALD A. RANDALL, WASHINGTON ATTORNEY

September 28, 1989

Mr. Chairman and Members of the Committee, I appreciate the opportunity to testify today in support of S-1630 amendment to the Clean Air Act. I am accompanied today by representatives from the Automotive Parts and Accessories Association (APAA), the Automotive Warehouse Distributors Association (AWDA), and the Specialty Equipment Market Association (SEMA). These trade associations represent over 15,000 independent automotive repair shop owners, parts manufacturers, sales representatives, distributors and retailers throughout the country. We have a demonstrated track record of effective competition throughout all segments of our industry, including the new car dealers. The motoring public has been the beneficiary of this vigorous competition.

We are here today to demonstrate our support for the agreement that we forged with Senator Baucus and Representative

Henry Waxman shortly before the summer recess. By simplifying the complex emission warranty language in the current Clean Air Act, this agreement provides for better environmental protection, better consumer protection, and more open competition in the automotive aftermarket industry.

Beginning with 1995 model vehicles, this agreement reduces both the defects and performance emissions warranties (Clean Air Act, Sections 207(a) and (b)) from 5 years/50,000 miles to 2 years, 24,000 miles. This will restore competition in the auto parts and repair industry by allowing consumers to choose where they want to have their emission related repairs performed after the 2 year/24,000 mile period, rather than being limited only to the new car dealers for emission repairs.

The agreement also establishes an 8 years/80,000 miles warranty on major emission control components, defined as the catalytic converter, the electronic control unit, and the diagnostic system, plus new emission parts costing over \$200. The agreement significantly and wisely expands and enhances inspection and maintenance programs and clarifies anti-tampering provisions. The agreement also requires that the emission diagnostic equipment required by the Clean Air Act have standardized connectors and information output in order to enable independent service providers to compete with new car dealers in the sale of diagnostic and repair work. Better repairs for motorists will result!

Finally, the agreement provides for motor vehicle

manufacturers to build and certify their emissions systems for 10 years/100,000 miles, thereby assuring the public of far more durable cars. Vehicles that do not comply with the law in significant volume can be ordered to be recalled by EPA at any time over this entire period.

This agreement gives a new vehicle owner a clear, workable and understandable emission control warranty. It also protects the American consumer by allowing them to have their vehicle emission system serviced and maintained at any place they choose. It also benefits the American public by providing for cleaner air without unduly harming competition.

In the past, our members have opposed the federally-mandated emissions warranties because of their anti-competitive impact. The warranties put the independent repair shops and parts manufacturers at a competitive disadvantage with the auto dealers, because vehicle owners are encouraged to return to the dealers.

The auto repair and service industry's annual sales are estimated to be in excess of \$140 billion, excluding gas and oil. The franchised new car dealers perform only about 24% of these repairs and services. The remainder is performed among the independents, the mass merchandisers and specialty shops.

This extensive industry is served by a complex infrastructure of auto parts manufacturers and distributors. The vehicle manufacturers provide comparatively few parts and materials used in this \$140 billion industry. The vast majority

of all parts, including those designated as "original equipment (OE)," are designed and manufactured by independent companies--not by the vehicle manufacturers. The franchised new car dealers primarily use the "O.E." parts distributed by the auto manufacturers, but many of these are manufactured by independent auto parts makers. The 230,000 repair establishments, however, primarily use other than "O.E." parts.

The automotive aftermarket, meaning sales after the original vehicle sale to the first vehicle purchaser, has traditionally been highly competitive. Aftermarket manufacturers are not only competitive in price, they are competitive in innovation and product quality, in level of service to their distributors and to the final users--the repair shops.

New vehicle purchasers have traditionally sought service and repairs from new car dealers only during the 2 years or 24,000 miles of their voluntary competitive warranty. Even prior to when the warranty coverage has expired, vehicle owners have sought service and repairs outside the franchised car dealerships. In large part, this owner-preference for service from the independent segment is due to price, quality of service and convenience.

The members of our four associations are concerned about the threat that the mandatory Federal emission control warranties have posed for competition in our industry. These emissions warranties artificially divert business from our members' shops to the car dealerships.

If Congress should retain this anti-competitive warranty at the present 5 years or 50,000 miles, it will have a devastating impact by further dislocating a significant part of the currently competitive service industry. This injury will become more pronounced as the I & M programs become more effective.

As the primary provider of parts and services to the U.S. car fleet, the independent network is an essential ingredient in the prescription for clean air that realistically calls for better vehicle care and maintenance. In other words, we are part of the solution. If inadvertently congress legislates us out of business by creating a new car dealer monopoly in the critical emissions field, then the solution is in jeopardy.

The emissions warranty, mandated by the Federal government, is unique. No other product sold in the United States has such a requirement which ties the purchaser of the product to the manufacturers and its franchised distributors.

The mandatory Federal emissions control warranties create a virtual monopoly under the hood of millions of motor vehicles sold annually. Although the monopoly applies to only emission control items or items that relate to or affect emissions, these warranties--and the public's perception of their coverage--channel millions of owners back into the new car dealerships for anticipated free warranty repairs. While these owners are captive of the new car dealers, they are sold other maintenance and repairs--not covered by the warranties. The combination sale of both warranty and non-warranty repairs will inevitably cause a

market dislocation of tens of thousands of small, independent repair shops throughout the country.

While we agree with the worthy objectives of the Clean Air Act, we strongly object to the establishment of an unregulated monopoly in the service and repair of our vehicle emission control systems. This anti-competitive system generates sales opportunities for the dealers that would not otherwise be afforded them in an open, competitive marketplace. By operation of federal law, the warranties deny our members equal protection of the laws.

The objectives of the Environmental Protection Agency (EPA), the environmentalists, and Congress to compel the vehicle manufacturers (1) to build more durable emission control systems and (2) to require vehicle owners to keep their vehicles in compliance can both be met by simply requiring vehicle owners to have them inspected for compliance annually. Thereafter, if the vehicles are not found to be in compliance, owners can have them corrected or repaired at the repair shop of their choice. Competition--not a government-mandated monopoly--can then be the best discipline, because the current monopoly acts as a disincentive for product innovation, price competition, and quality service. Furthermore, vehicle inspection and the free market approach will afford EPA, under the existing law, sufficient data to enforce mandatory recalls where EPA finds a significant number of vehicles to be not in compliance with federal emission standards. Senator Baucus' bill, S. 1630,

proposes to extend the time and scope of the recall authority to 10 years or 100,000 miles.

Consumers are confused by the various warranties. Dealers and independent repair shop owners are also confused and uncertain about what is and is not a "covered repair" under these various warranties.

Under this cloud of uncertainty, the consumer-preferred independent shop owner is often forced to send his customer to his new car dealer competitor. You can imagine the impact this sacrifice has on his bottom-line and his outlook--particularly when he later finds out that no warranty work was performed and his customer ended up paying top dollar for repair and service performed.

The vehicle manufacturers offer voluntary new car warranties which vary from 12 months on ignition, electrical and rubber parts to 24 months on a limited number of wearable parts, i.e. suspension and steering parts. Recently, new voluntary competitive limited warranties have been extended by General Motors and Ford to 6 years or 60,000 miles and by Chrysler to 7 years or 70,000 miles. These extended warranties are very limited. They apply only to low-wear drive train components and parts. Additionally, the manufacturers offer extended paint and corrosion warranties.

All of these voluntary warranties are difficult to read and understand. Compounding this consumer confusion problem are the car manufacturer and dealer-offered competitive extended service

contracts. These provide for limited specific service and repairs beyond the traditional 24 months or 24,000 miles period. We can compete with these. We have for years and will in the future.

The federally required emissions control warranties under Clean Air Act Sections 207(a) and (b) only serve to further complicate the state of confusion. In addition, the State of California has a waiver which permits that state, with over 10% of the nation's vehicle population, to require warranties that vary from those required by the EPA.

Few dealers or repair shop owners understand the terms and conditions of the current Federal mandatory warranties. Even fewer vehicle owners understand them. Most vehicle owners misperceive what is and is not covered under both the competitive voluntary warranties and the mandatory Federal emission warranties.

Congress and the EPA do not have adequate facts or data to justify the existing monopoly that the federal emissions warranties create for the new car dealerships. This unregulated monopoly system inflicts unnecessary costs upon the American public. The Federal Trade Commission and the Department of Justice have previously agreed with this position.

This monopoly serves to increase service and repair prices, stifle innovative product competition, breed mediocre quality parts and service, and force a concentration of automotive service into larger and larger dealerships.

Consumer dissatisfaction with the quality of dealerships' service under warranties has been documented by the U.S. Senate Antitrust Subcommittee and by the FTC during extensive investigations and hearings in the 1970's. Recent data from the Better Business Bureau (BBB) demonstrate that consumer complaints about unsatisfactory dealer service ranks first in all auto repair complaints. The independents can effectively compete against these voluntary warranty programs.

Senator Baucus and the cosponsors of S. 1630 should be commended for seeking a means for promoting competition in price and quality of parts and service in the automotive aftermarket. As set forth in S. 1630, the present 5 year/50,000 miles emissions warranty under the Clean Air Act will be clarified and cover for 2 years/24,000 miles the complete emission system.

About 50 million vehicles, or 30 percent of our current light vehicle population, is now subject to state emission inspection and maintenance programs (I&M). Under EPA guidelines, about 25 percent of those 50 million vehicles will fail those inspections. That is 12,500,000 vehicles annually that will, under the current emissions warranties, be directed by EPA and state officials to go to the new car dealers for repairs unless the law is changed.

Inspection and maintenance programs will continue to be expanded over the next few years. Millions more motorists will be advised by EPA and state officials to return to the dealerships to correct their emissions systems up to 5 years or

50,000 miles. Under S. 1630, this will generally be for only the first 2 years or 24,000 miles except for the catalyst, the ECU, the diagnostic system and other new components costing over \$200.

Competition for these sales and services after 2 years or 24,000 miles, rather than a monopoly in the hands of the dealerships, would better serve the millions of new vehicle purchasers and promote competition in the automotive service industry. The total cost to the motoring public WILL be far less under a competitive system. In our judgement, S. 1630 will be the most effective means of assuring that competition. We urge the Committee to adopt S-1630.

STATEMENT OF DON BECKETT

ON BEHALF OF

AUTOMOTIVE SERVICE INDUSTRY ASSOCIATION
MOTOR AND EQUIPMENT MANUFACTURERS ASSOCIATION

BEFORE THE SENATE COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS

SEPTEMBER 28, 1989

Mr. Chairman and Members of the Committee:

My name is Don Beckett. I own and operate Quality Muffler and Brake Shops in Vineland, New Jersey. I am very pleased to be here today to discuss a specific ozone and carbon monoxide nonattainment issue -- namely, the useful life and mobile service warranty provisions of the Clean Air Act.

While I am testifying today on behalf of the two most important associations in our industry (Motor and Equipment Manufacturers Association and Automotive Service Industry Association). Each of these organizations will be submitting a written statement to the Committee. I am far from a professional lobbyist or lawyer. Certainly I have been interested for several years in the issues we are discussing, and have written regularly about them in the magazine Exhaust News. I make my living, however, selling automobile parts and service, and the catalytic converter and its associated parts are among the items we see on a regular basis. I believe that my comments today would be endorsed by most people actually servicing cars.

I start from the premise that there is now widespread agreement that the warranties -- both design and performance -- on virtually all emission-related parts should be reduced to 2 years/24,000 miles. This recognizes that parts need to be maintained and replaced, and that such maintenance will do more to reduce vehicle emissions than warranties which, in fact, encourage car owners to ignore maintenance. We also

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believe, of course, that federally-mandated warranties encourage car owners to return to franchised dealers, thereby reducing needed competition in the sale of parts and servicing of vehicles. We are pleased that most bills which have been introduced recognize these facts by reducing the warranties on most parts and increasing the stringency of state inspection-maintenance programs.

Disagreements in the warranty provisions have arisen primarily with respect to the length of the warranties for the catalytic converter and the electronic control unit. Congressman Waxman (H.R. 2323) and various members of this Committee (S.1630) would extend warranty coverage for these two components (in addition to other new emission control components costing over \$200) beginning with 1995 vehicles to 8 years/80,000 miles, while President Bush (H.R. 3030) and Congressman Dingell (H.R. 2950) would maintain those warranties at 5 years/50,000 miles. We wholeheartedly agree with this latter approach.

From a personal standpoint, of course, it would be devastating to my business if we could not replace the catalytic converter until the car has travelled 80,000 miles. This will also be true for other exhaust shops. Repair shops in general will be hurt because car owners will tend to return to their franchised dealer when warranty coverage is a possibility. But even more importantly, the longer warranty will not clean up the air. As most people now recognize, the

longer warranty will discourage maintenance, which is the key to cleaner air. I have spoken with dozens of customers who tell me that maintenance should not be necessary since there is a 5 year/50,000 mile warranty. This situation can only be made worse with extended warranties. Why would we want to encourage this counterproductive tendency?

Unfortunately, I believe the same is true for proposals to increase the vehicle's useful life, for recall and certification purposes, to 10 years/100,000 miles. With respect to recalls, most cars are sold to a second owner by the time 5 years/50,000 miles are reached. Based on experience, it is unrealistic to expect these second or third owners to respond to a recall notice (if they find out about it). As a result, the recall extension may make us feel good psychologically, but it is unlikely to result in cleaner air.

The proposed increase in new vehicle certification is equally troublesome. It has not been possible to develop a 50,000 mile certification test which is representative of the vehicle-in-use, and this will be even more difficult with a 100,000 mile test. Instead, the likely result is a consumer mind-set that maintenance is unnecessary. As we have already seen, this is a false belief and it will continue to be so. We should be encouraging owner maintenance and not owner neglect.

The views which I have expressed today are borne out of years of talking with car owners and servicing their

vehicles. I know that owners don't take care of their cars as well today as they did before they were told that maintenance is unnecessary. This has hurt the car owner -- who subsequently pays higher repair bills -- and the public, which must breathe the air poisoned by untuned and unmaintained vehicles. As a matter of public policy, I believe that we should be encouraging car maintenance, and that this goal is best accomplished by the combined proposals of President Bush and Congressman Dingell.

I very much appreciate the opportunity to be here today on behalf of the two major associations in our industry, and will be glad to answer any questions which the Committee may have.

Testimony
of the
Engine Manufacturers Association
Before the
Subcommittee on Environmental Protection
Committee on Environment and Public Works
U.S. Senate
Concerning: S. 1490 and S. 1630

Jed Mandel, Esq.
General Counsel
Engine Manufacturers
Association
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312-269-8042

Testimony
of the
Engine Manufacturers Association
Before the
Subcommittee on Environmental Protection
Committee on Environment and Public Works
U.S. Senate
Concerning: S. 1490 and S. 1630

Mr. Chairman, I am Jed Mandel, General Counsel of the Engine Manufacturers Association. My comments today relate to the concerns of heavy-duty diesel engine manufacturers regarding S. 1490 and S. 1630. EMA and its members have cooperated in government efforts to regulate emissions from heavy-duty engines for twenty years. We are ready and willing to do our part to meet the Nation's clean air needs.

That endeavor necessarily starts with the standard setting process and the requisite emission standards for heavy-duty diesel engines. The current Clean Air Act provides a four-year lead time and three-year period of stability for heavy-duty diesel engine emission standards. S. 1490 would delete that requirement. S. 1630 does not change it.

It is critically important to retain this lead time and period of stability. Heavy-duty diesel trucks typically are not the product of vertically integrated manufacturers. Typically, one company makes the

engine and another one assembles the truck. A minimum four-year lead time and three-year period of stability allows engine manufacturers to adequately plan for their diverse customers' needs. Moreover, four-year lead time is necessary because, unlike passenger cars, heavy-duty engine and vehicle product development and life cycles are longer, their volumes are smaller and their time period for return on investment is longer. In addition, a three-year period of stability is necessary in order to take into consideration the burden which certification places on manufacturers. When new or revised emission standards are issued too frequently, a manufacturer's testing facilities and other engineering resources may be severely overburdened.

S. 1490 does not mandate specific emission standards. It properly delegates to EPA the authority to set standards through the regulatory process when the requisite technical expertise is available. Any attempt to legislate specific statutory standards risks ignoring the technological feasibility of a mandated emission level and the trade-off inherent in controlling certain related emissions. In fact, S. 1630 makes just such an error in mandating a heavy-duty diesel NOx standard of 4.0 g/bhp-hr in 1994 and 2.0 g/bhp-hr in 2003. Both EPA and the National Academy of Sciences have stated that a NOx standard more stringent than 5.0 g/bhp-hr is not technologically feasible in conjunction with a 0.1 g/bhp-hr particulate standard. The responsibility for establishing the technological limits of the heavy-duty NOx standard, or for any other emission standard, should rest with the EPA.

Equally important to the standards setting process are policies and procedures related to compliance. Both S. 1490 and S. 1630 would authorize EPA to shift its administrative and enforcement costs to manufacturers. Requiring such fees of manufacturers essentially authorizes EPA to proceed with programs without regard to their costs or benefits since none of the costs will fall upon EPA. In essence, EPA would be authorized to tax the public, who ultimately will bear these costs, without any Congressional oversight. EPA should not be allowed to impose such an unfair tax on those who are willing to buy the new, most advanced, emission control technology.

In order to reduce the costs of compliance without adverse environmental impact, EPA has allowed heavy-duty engine manufacturers the flexibility of averaging the emissions from engine families within the same class and category. S. 1630 would prohibit such regulatory flexibility programs. S. 1490 would encourage them. EMA and its members believe that EPA's authority to provide such programs should not be constrained. Averaging, and similar regulatory flexibility programs such as banking (averaging over time) and trading (averaging between manufacturers), can aid manufacturers in reducing the costs of controlling emissions. However, they must and can be structured appropriately to avoid adverse environmental and competitive impacts. Moreover, such programs will encourage the development and earlier introduction of improved emission control technologies alternate-fueled vehicles.

Two other compliance-related issues have been raised. S. 1490 would authorize EPA to prescribe rebuild practices and promulgate emission standards for rebuilt engines. S. 1630 would mandate the use of data from state inspection and maintenance programs in determining whether an engine nonconformity should be recalled.

The heavy-duty engine industry does not oppose providing EPA with authority to study and potentially regulate rebuild practices and emissions. However, no such regulations should be imposed until the need for and feasibility of such regulations have been established. The feasibility of rebuild regulations is questionable because rebuild work may be performed at factory-owned or factory-authorized facilities or by a myriad of small independent businesses. It is critical for both its study and any subsequent regulations that EPA take into consideration such factors as costs, lead time and technological feasibility. Moreover, such study and any such regulations also should insure that there be no adverse competitive impacts from rebuilt engine regulations. Rather than regulating rebuilt engines, Congress and the EPA should consider whether inspection and maintenance programs might not be a more effective means of in-use emission control.

In considering the use of data from state inspection and maintenance programs, Congress should be mindful that the data from such programs can not reveal whether failed engines were properly maintained, illegally tampered with or within their useful life period. Thus, the provision in

S. 1630 that would mandate the use of data from state I/M programs in determining whether there is engine nonconformity would make manufacturers responsible for their customers' improper maintenance and illegal tampering. Congress should not impose such an unfair requirement.

S. 1490 and S. 1630 both would require the nation-wide availability of low sulfur diesel fuel by October 1, 1993. EMA and its members have been strong proponents of such a provision. In cooperation with the petroleum refining industry, we jointly recommended to EPA the adoption of a low sulfur fuel requirement essentially the same as that in the two bills. EPA proposed such a rule on August 24, 1989. A .05% diesel fuel sulfur level will remove a major hurdle to achieving the 1991 and 1994 particulate standards and will improve ambient air quality.

Finally, S. 1490 would authorize the regulation of non-road engines while S. 1630 would mandate such regulations. Although the heavy-duty engine industry does not oppose providing EPA with authority to study and potentially regulate the emissions of non-road engines, such authority should not include a mandate to regulate. Furthermore, no such regulations should be imposed until the need for and feasibility of such regulations have been established.

The emissions contributions from non-road mobile sources are relatively small; tend not to be located in or affect non-compliance areas; and would be extremely costly to control. Further study, taking into consideration health needs, costs, technological feasibility, safety, availability of adequate emission data and test procedures and the need to differentiate among distinct engine application needs, must be undertaken before actual regulations, if any, of non-road sources are promulgated.

In addition, the regulation of non-road engine emissions should not be linked to the existing regulations for on-highway engines. There is little similarity of engine configuration, horsepower rating or work to be accomplished between on-road and off-road engines. Moreover, the truck engine's transient test cycle, used to determine compliance with emission standards, would not be representative of the usage of a non-road engine. EMA is a member of and supports the comments of the Off-Highway Mobile Equipment Coalition.

Mr. Chairman, thank you for this opportunity to discuss these important legislative issues with the Subcommittee.

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TESTIMONY OF

EMMETT BARKER
On behalf of the

OFF-HIGHWAY MOBILE EQUIPMENT COALITION

before the

Subcommittee on Environmental Protection
Committee on Environment and Public Works
U.S. Senate

28 September 1989

Concerning:
Proposed 1989 Amendments to the Clean Air Act

Mr. Chairman, I am Emmett Barker, President of the Farm and Industrial Equipment Institute. I'm here today to speak on behalf of the Off-Highway Mobile Equipment Coalition. The Coalition represents manufacturers and users of engines and machines designed for off-road applications. The companies and associations cooperating in this effort are:

J. I. Case Company
Caterpillar Inc.
Construction Industry Manufacturers Association
Deere & Company
Engine Manufacturers Association
Farm and Industrial Equipment Institute
Ford New Holland, Inc.
Kubota Tractor
National Marine Manufacturers Association
Westinghouse Electric (Thermo King)

We appreciate this opportunity to comment on proposed legislation dealing with emissions standards for non-road engines.

There are two important points I would like to make about emissions from non-road engines. These observations then lead us to several conclusions

which we believe are relevant to the task of developing legislation in this area.

The first is that non-road engines merit separate consideration in the legislative and regulative process because they are different in type and function from other engines, particularly engines which are used to power on-road vehicles.

The second point is that the impact from non-road engines on human health and air quality have not been studied sufficiently to determine what level, if any, of regulation is appropriate.

Let me return to the first point to explain it in a bit more detail.

1) There are substantial differences between engines used in on-road vehicles and those used in non-road equipment that bear on emissions control.

a) There is a greater variety of engines used in non-road machines. These engines are not only different from on-road engines, but also are different from each other, both in configuration and the uses to which they are put. Engines for each type of equipment, whether used on or off road, are designed or chosen because they are best suited for the job at hand. On-road trucks perform one basic job: They pull loads over paved highways and streets between two points. They use high specific output (high horsepower relative to displacement) engines because higher horsepower per pound moves bigger loads faster. These engines, and the emissions control technologies that have been developed for them, operate well in the relatively clean and shock free highway environment.

Non-road equipment uses diesel engines from 8 horsepower (for mobile refrigeration units) to as much as 4200 horsepower (for diesel-electric locomotives). Considering just farm and industrial equipment, there are at least 33 separate families of equipment, each designed to perform a particular range of jobs. Bulldozers, for example, are primarily used for moving dirt from where it is to where it is needed. But that can vary from low speed/light load, fine grading in sandy soil to full load, heavy dozing and ripping in rock. In between, a modified bulldozer may be used for log skidding, pipe laying, or pulling heavy loads. Other equipment families -- from farm tractors to hydraulic excavators to four wheel drive loaders -- perform entirely different tasks. Most of these jobs require high engine power at low speeds as well as the ability to sustain sudden severe load changes without faltering.

The engines that best perform many of these tasks operate at much lower specific outputs than truck engines. Low specific output engines inherently have the greater low speed torque, lugging ability, and load response that the heavy-duty work done off-road requires. Emissions control technologies that were developed for high specific output, on-road engines simply cannot be directly transferred to most non-road engines with such significant differences in design and operating characteristics.

Furthermore, many non-road engines are designed to be an integral part of the equipment they power which includes a specific drive train and hydraulic and cooling systems. The engine size, weight and performance characteristics can all be part of an integrated design which, once determined, leaves very little flexibility for engine modifications or for the use of other engine models.

b) Another major difference between on and off-road engines is that the off-road machines are produced in much lower volumes. This means that the R & D, design modification, and production costs have to be spread over production volumes numbering typically in the hundreds of units or fewer. For example, total production of railroad locomotives averaged only about 300 units annually between 1983 and 1987. Other similar examples could well be cited for the industrial and construction equipment manufacturing industry. The very highest volume equipment families in this industry total in the 10-20,000 per year range. And this volume is divided among various manufacturers and models. Emission control costs also are escalated by the variety of engines and applications I have previously described and the inability of individual technological fixes to cover them all.

c) Diversity creates other problems as well. For example, one manufacturer uses the same basic 80 hp engine for each of these machines: a utility farm tractor, a crawler dozer, a backhoe-loader, a front-end loader, and a log skidder. Changing the engine would require changing all five machines. This means that any new technology developed to reduce emissions must be designed into many more engine/machine combinations than for on-road, and these specialized engineering costs must be recovered from fewer unit sales. So the engineering task of bringing non-road engines into compliance with new regulations is relatively larger.

2) The second major point I referred to earlier is that a thorough study of emissions from non-road engines is needed to insure that any regulatory program which may be adopted is based on solid information.

a) For one thing, currently no way to accurately measure emissions from off-highway equipment has been developed. No test procedure has been established. It took five years to develop the present transient test cycle used by EPA to certify emissions levels of on-highway trucks. This test cycle, which simulates truck operation in L.A. Freeway and L.A. and N.Y. non-Freeway settings, is clearly unrepresentative of the vast array of applications and duty cycles that characterize off-highway equipment.

b) Moreover, because of the widely dispersed use of non-road engines, reduction of emissions from them may not lead to significant improvements in air quality. A high percentage of off-road equipment is located and used in rural areas where air is abundantly cleaner than ambient air quality standards. While locomotives pull trains into and through cities, a very significant percentage of railroad miles is through open country. Likewise marine engines propelling boats which push barges up and down the rivers of the Central United States operate primarily in open spaces. While some construction and industrial equipment is found in cities, a great proportion of this equipment is in rural areas, particularly for road building and maintenance, forestry and increasing productivity of agricultural land. It goes without saying that most of the nation's agricultural equipment is used on farms rather remote from urban areas. Whatever figures may be assembled dealing with emissions from non-road machines should be tempered with this location factor before any estimates of air improvement in non-attainment areas are calculated.

c) This leads to a more general point: no one really knows the actual contribution of off-road diesel engines to ozone non-compliance or other air quality problems. There are no scientifically responsible, definitive studies on the subject. We are aware of only one recent national study which has sought to

evaluate the benefits of imposing regulations on non-road engines. (For the record, Mr. Chairman, I would like to submit the joint statement of three of the organizations participating in this coalition on this study.) This study, conducted by the Radian Corporation, includes a "Limits and Caveats" provision which states that the study should not be used as a basis for regulating non-road engines. More work must be done before technical feasibility and cost effectiveness of off-road engine emission controls could be determined. Energy and Environmental Analysis, Inc., did a more credible job for the California Air Resources Board -- but only for construction equipment used in California.

We believe that a comprehensive and reliable study of the non-road equipment industry's contribution to air quality problems is essential prior to any reasonable program of regulation. Such a study would provide a much sounder basis than now exists for deciding whether emissions controls on non-road engines and vehicles are justified.

If upon reviewing the results of this study the EPA Administrator concludes that controls are warranted, he should have the authority to impose them, but only after taking the following factors into account:

- o The expected improvement in air quality;
- o The time required to develop safe and effective emissions control technologies, apply them to wide range of dissimilar engines, retool, produce and install the redesigned engines;
- o The time required to develop test cycles that reasonably represent the wide variety of duty cycles found in non-road vehicles; and
- o The costs of compliance to the industry and its customers.

3) The two major points I have sought to establish today lead, then, in our view to several important conclusions for any proposed legislation.

- o It is not appropriate or workable to require that off-road diesel engines meet the same emissions standards and compliance timetables that are mandated for on-road diesel engines. The differences with regard to engine function, engine size, engine configuration, and engine production volumes require both different control strategies and different testing methods. While we disagree with parts of the EEA study and much more of the Radian study, we wholeheartedly endorse the conclusions of both studies that different levels of controls for on-road vehicles and non-road equipment and for different classes of non-road equipment are appropriate, should standards be imposed. They based these recommendations on consideration of factors unique to the industry like those described in this testimony.
- o Any legislation adopted should not itself prescribe the standards or timetables under which off-road engines must operate. The situation is so complicated, diverse, and technologically fluid that if authorizing legislation is adopted, the regulatory details should be left to the EPA administrator. The administrator, then, could study the situation thoroughly and set emission standards for non-road engines to take into account their varying sizes and other special factors discussed earlier.
- o Because the engineering problems discussed above are "technology-challenging" and broad in scope, the EPA administrator should be given freedom to provide for the lead time necessary to complete the

engineering changes, particularly for the small, naturally aspirated engines used in small equipment.

- o Any authorizing legislation should contain the same preemptive language for off-road engine emission regulation as is provided in current law for on-road engines. The complexities and low-volume problems previously discussed make even more acute the problem of trying to satisfy different requirements in many different states.

Conclusion. In summary, the position of the Off-Highway Mobile Equipment Coalition is that if a reliable, verifiable study made by qualified experts finds that our engines do contribute significantly to the non-attainment problem being experienced by major metropolitan areas, then any emission control program must take into consideration the diversity of sizes and applications of off-road engines, their unique functions, very low production volumes, the limitations of available emissions control technology, and the significant lead time required.



**NEW YORK CITY
DEPARTMENT OF TRANSPORTATION**

40 Worth Street New York, N.Y. 10013

**Ross Sandler
Commissioner**

**Statement By Ross Sandler, Commissioner
New York City Department of Transportation**

Before the U.S. Senate

**Environmental Protection Subcommittee,
Environment and Public Works Committee**

Concerning

**S. 1630, the Clean Air Restoration and Standards
Attainment Act of 1989**

and

S. 1490, the Clean Air Act Amendments of 1989

September 28, 1989

Introduction

Good afternoon Senator Baucus and other distinguished members of the Environmental Protection Subcommittee. As Commissioner of the New York City Department of Transportation, I am pleased to appear before you today to offer comments on the transportation elements of S.1630, the Clean Air Restoration and Standards Attainment Act of 1989, and S. 1490, the Clean Air Act Amendments of 1989.

I would like to present to you our perspective on the steps we must take if we are serious about addressing clean air issues. Bill No. 1630 provides much of what we need. The bill includes a menu of transportation control measures, from which localities could choose those that make sense for them. It includes tougher conformity requirements to ensure that transportation funding decisions serve clean air goals. The bill also provides essential funds in non-attainment areas through requiring a \$2.00 auto registration fee and making available federal funds (with a 10% State match) for transportation control measures.

The numbers used in our presentation today are provided for illustrative purposes only. More accurate figures will be the outcome of a new \$2.7 million City-funded study (supported in addition by \$400,000 in Clean Air Act funds). Since the New York City carbon monoxide problem is of an areawide scope, many of the concepts apply equally to ozone non-attainment areas. Our ozone problem is also severe.

Daily Traffic to Manhattan

New York City's problem is traffic. The continued growth of traffic will overwhelm benefits achieved from vehicle turnover. Since 1978, vehicle entries into Manhattan have increased at a rate of 2.2% per year. Manhattan is besieged daily by 100,000 more vehicles now than it was a decade ago--with no additional roadways.

Goals

New York City wants what most localities want. We seek healthful air for our citizens, an approvable and workable State Implementation Plan, mobility for our businesses and commuters, and a transportation system that can support growth and development. Amendments to the Clean Air Act need to recognize that clean air programs must be consistent with these social and economic needs.

Carbon Monoxide

New York City had the highest concentrations in the nation of carbon monoxide measured in 1987. Ninety percent of New York City's carbon monoxide comes from motor vehicles.

Solutions

We have categorized the possible ways for reducing CO concentrations. There are only three basic ways to do that: clean up the exhaust from vehicles, speed traffic along so that emissions are minimized, or, plain and simple, reduce the number of vehicles travelling in congested areas. Using vehicles in motion (VIM), which is a measure of traffic density and, indirectly, of pollution, we can estimate the benefits of each of these approaches. We see in New York City that we must obtain a substantial reduction in VIM to meet our clean air goals. The opportunities for achieving this reduction-- cleaner vehicles, increased speeds, and fewer vehicles are all necessary; all must be pursued.

Cleaner Vehicles

This group of measures continues to hold great promise and is the most acceptable to the public. The nation has had great success with the federal motor vehicle control program. The turnover of older vehicles being replaced by newer, better-controlled vehicles is primarily responsible for past gains. We support the provisions of S. 1630 that will continue this process of further tightening tailpipe controls. This would be assisted further by enhanced inspection and maintenance programs. We support strong alternative fuel provisions that ensure the availability of alternative fuels and low polluting vehicles.

Increase Speeds

Traffic flow improvements not only reduce emissions but also improve mobility - at least for a while. We find that motorists quickly fill up any unused roadway capacity and congestion returns. In New York City, we rely greatly on a force of 2,100 traffic enforcement agents to prevent gridlock and keep illegal parkers from blocking traffic lanes. We are also computerizing our traffic signals. We cannot add physical capacity to our roadways. We believe that programs to increase traffic speeds will lead to a minimal decline in pollution.

Fewer Vehicles

There are three primary ways in which we can reduce the number of vehicles on our streets: make transit more attractive, obtain voluntary shifts in vehicle usage, and impose restrictive measures.

New York City is home to 64% of the nation's rail rapid transit riders. A total of 83% of the rush hour commuters to the Manhattan CBD arrive by public transportation. The Metropolitan Transportation Authority is in the midst of a \$17 billion capital program. In addition to the 75,000 passengers transported daily on the City's Staten Island Ferry, we have 6,000 riders on private ferries. This will rise next month to 16,000 when new service from Hoboken to Lower Manhattan starts. We have 29 miles of bus lanes.

Mass transit is already essential to life in New York City. Without multimillion dollar enlargements or extensions to the transit system, transit improvements can account for only a limited reduction in VIM.

An alternative option is to pursue voluntary reductions in vehicle usage. We will continue to pursue such measures but their value is difficult to predict.

Thus, we are forced to recognize that we need to reduce vehicles in motion substantially but are able to achieve only a small portion of that reduction through increasing speeds and encouraging transit use, leaving the lion's share of the problem unsolved.

An option left to us is restrictive measures. Examples of these measures may include ridesharing requirements, congestion pricing, and regulating entries to the CBD by license plate number. Such measures are least liked by the public. They require the combined backing of the federal, state, and local governments. This is why the provisions of S. 1630 are so important. Restrictive measures could be effective and need not detract from our continued efforts to maintain mobility and access.

Conclusions

Traffic flow, transit improvements, and voluntary actions cannot solve the problem alone. There is great hope for new technology, but it is not yet proven. Fewer vehicles will surely need to be part of the solution. Unless Congress intends to send us on an impossible mission, you must be clear in the Clean Air Act, as proposed in bill no. 1630, that these sorts of measures will be expected.

Senate bill no. 1630 goes a long way toward dealing appropriately with our air pollution problems. The City of New York has specific comments on the bills being considered, which we will forward at a later date for your consideration. I would be happy to answer any questions you may have. Thank you for your kind attention.

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NATIONAL PARKING ASSOCIATION

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Statement of Regina McLaurin, President

NATIONAL PARKING ASSOCIATION

before the

SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

on S. 1630

The Clean Air Restoration and Standards Attainment Act of
1989

September 28, 1989

STATEMENT of
REGINA McLAURIN, President
for the
NATIONAL PARKING ASSOCIATION

The National Parking Association ("NPA") and its members throughout the country appreciate the opportunity to present their views on S. 1630, the proposed "Clean Air Restoration and Standards Attainment Act of 1989."

NPA, the national trade association of the commercial parking industry, was established in 1951. Its members today include over 175 companies which own or operate commercial parking facilities; over 170 parking facility administrators for hospitals, educational institutions, and municipalities; and nearly 150 commercial manufacturers and suppliers of parking facility equipment. Our industry, which employs tens of thousands, is an essential part of the fabric of American urban life.

SUMMARY

NPA is most interested in seeing the Congress achieve two national priorities:

- o protection of the environment, and
- o preservation and revitalization of our cities.

Fortunately, these goals are entirely compatible. To revitalize our cities, we have to attract people into them -- to work, to live, to shop, to dine, to be entertained. Congestion and pollution turn people off and keep them away. That is bad for our cities, and bad for the business of NPA's members. We who operate parking facilities do not want unlimited numbers of automobiles coming into downtown areas; to the contrary, we want to see less congestion and pollution, so that people will live, work, and pursue cultural and leisure activities downtown. We believe that only a balanced transportation system can achieve these objectives.

For that very reason, NPA strongly supports not only stricter emissions controls, improved and enhanced inspection/maintenance programs, and the rapid phase-in of clean-fueled motor vehicles, but also transportation control measures that make it easy and attractive for people to get into the city while helping in some degree to reduce emissions. NPA supports improved mass transit, HOV lanes, ride-sharing, work schedule changes, employer ridership programs, and traffic flow improvements and enforcement.

S. 1630 would, however, also require states to adopt draconian measures which simply restrict or penalize automobile access to or within downtown areas, including automobile access restrictions such as trip reduction ordinances, vehicle restricted zones and restriction of entire roads, and punitive access charges such as road use charges, tolls, and parking surcharges. NPA opposes these measures because they would drain people, jobs and economic vitality out of our central cities, while ultimately doing nothing to curb overall pollution:

o By their nature, such measures often do not cut congestion and emissions but merely relocate them. People headed downtown simply drive around costly or restricted access points, thereby creating new sources of congestion and pollution.

o Measures targeted at downtown-bound traffic have become -- and will continue to be -- increasingly irrelevant in the effort to curb vehicle miles traveled and congestion. Already, the "typical" worker is not going downtown at all: the dominant commuting pattern in America is now suburb-to-suburb, and that trend is growing fast. Population, jobs, traffic and congestion continue to move to the suburbs. Restricting automobile access to downtown areas does nothing to address the fastest-growing sources of vehicle travel growth and congestion.

o To the contrary, such restrictive measures will only exacerbate the growth of vehicle traffic and congestion. Many people simply cannot switch from private automobile use to other modes to get into the city -- people who live far from mass transit, parents driving children to day care on the way to work, sales people, the elderly, handicapped and many others. Ever-tougher measures, designed as a "stick" to beat people out of their automobiles, will instead only induce them to look for work in the suburbs -- where more people own cars and are driving increasingly longer distances to get around. That would result in more vehicle travel, new and more numerous sources of congestion and, ultimately, more automobile pollution.

o At the same time, by pushing people, businesses and jobs out of downtown areas, these measures can only hurt the effort to revitalize our cities, by further eroding the tax base and abandoning the poor and the elderly in the urban core.

NPA urges that these self-defeating measures -- punitive access charges and automobile access restrictions --

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not be encouraged and should, therefore, be deleted from the bill. Other transportation control measures should be mandated only to the extent that states can ensure adequate access to downtown areas. Moreover, states should be directed not to implement measures that merely divert automobile congestion and pollution elsewhere.

I. S. 1630 -- Transportation Control Provisions

S. 1630 would amend Section 108(f) of the Clean Air Act to require the Environmental Protection Agency ("EPA") to make available to state and local agencies information about 14 categories of transportation controls. Under a proposed new Section 183(c) of the Act, states with areas classified as "severe" ozone nonattainment areas would, in addition to all other required measures, have to revise their State Implementation Plans ("SIPs") to include transportation control measures "to offset any growth in emissions from vehicle miles traveled or numbers of vehicle trips in such area."

Such states would be required to consider all of the measures specified in Section 108(f); if any such measure is not included, the SIP would have to explain why and specify what other measure would be taken to provide a comparable reduction in emissions. This requirement would also apply to "extreme" ozone nonattainment areas, as well as "serious" carbon monoxide nonattainment areas under new Section 189. (In addition, under certain circumstances, states with "serious" ozone nonattainment areas would also be mandated to implement transportation control measures selected from Section 108(f).)

II. Congress Should Mandate Measures That Facilitate Access and Help Cut Emissions

For severe and extreme ozone nonattainment areas, and serious carbon monoxide nonattainment areas, S. 1630 would mandate implementation of a number of transportation control measures which may help to reduce emissions and which also promote the revitalization of our center cities by reducing congestion and making access easier and more attractive. As set forth in the proposed amendment to Section 108(f), these include:

- (a) "programs for improved public transit," which NPA strongly supports and considers to be the key to reducing congestion in downtown areas;

- (b) "employer-based transportation management plans," such as incentives for carpooling, which have proven successful and popular;
- (c) "traffic flow improvement programs" which will make it easier for people to get around downtown areas and promote more efficient peak period usage of existing roadways (including diligent enforcement of those programs through ticketing and towing);
- (d) "fringe and transportation corridor parking facilities," which will help promote use of mass transit by making it accessible to people who do not live near bus or subway stops and thus have to drive to and park at those stops;
- (e) "programs for the provision of all forms of high-occupancy shared ride service"; and,
- (f) programs for bicycle storage and lanes, which will encourage greater use of this transportation mode.

These measures, in addition to helping reduce pollution, will generally make it easier and more pleasant to get to downtown areas for all those who can avail themselves of these programs and alternatives. NPA enthusiastically supports their inclusion in proposed Section 108(f), and the requirement that states include them in revised plans for the designated nonattainment areas.

III. Congress Should Not Mandate, or Even Encourage, Measures to Penalize or Restrict Access to Downtown Areas

S. 1630 would also require states to include, in revised plans for serious carbon monoxide nonattainment and severe and extreme ozone nonattainment areas, several measures which would restrict or penalize automobile access to downtown areas. These include:

- (1) road use charges and tolls;
- (2) parking surcharges or other pricing mechanisms;
- (3) vehicle restricted zones or periods;
- (4) restriction of entire roads to passenger buses or high occupancy vehicles (i.e., prohibiting

single-driver cars from those roads altogether); and,

- (5) "trip reduction ordinances," to the extent such ordinances may ban driving on certain days or at certain times.

For several reasons, these measures would simply hurt our urban areas, while doing nothing to help reduce overall congestion and pollution:

A. Punitive Access Charges and Automobile Access Restrictions are Ineffective and Counterproductive

By their very nature, downtown automobile access restrictions and charges tend not to reduce automobile travel and emissions, but only to relocate them. People headed downtown tend to ignore, bunch up at or drive around restricted access points and routes, thereby doing little more than creating new areas of congestion and pollution. Not surprisingly, then, there is evidence that in many cases such measures are essentially useless or even counterproductive.

(1) Road use charges and tolls. In his comprehensive study of the economics of air pollution control, Donald Dewees concluded that:

Charging tolls for road use also cannot have much of an effect on total emissions. Higher tolls on existing toll roads will discourage only a small percentage of motorists (given observed price elasticities of demand for motoring), and some of them will simply use slower, parallel toll-free roads. [Economics and Public Policy: The Automobile Pollution Case 95 (MIT Press 1974)].

A study of a possible scheme to charge automobiles a toll to allow them to enter the Central Business District of Washington, D.C. predicted that a \$1/day fee would cause a net reduction in vehicle miles traveled ("VMT") of only 3/10 of 1 percent. The study further found that the effectiveness of such measures increases depending on how high the fee is compared to income levels -- meaning that, to have any real effect, such tolls would have to punish the lowest income workers severely for trying to get to work. (Cambridge Systematics, "Carpool Incentives: Analysis of Transportation Impacts," June 1976, cited in U.S. Dept. of Transportation, "The Costs and Effectiveness of Transportation Control Meas-

ures in Achieving Air Quality Goals" (August 1981) (hereafter "1981 DOT study") at pp. 33 - 34).

Further, toll stops obviously create back-ups of idling cars which become new locations of congestion and pollution, and which may well offset or exceed the marginal results of any tiny reductions in VMT. Indeed, in a review of the advantages and disadvantages of toll roads, one expert concluded that "air quality and fuel consumption suffer because of toll stops." (Wuestefeld, "Toll Roads," Transportation Quarterly 5, 12 (Jan. 1988)).

(2) Parking surcharges. While there are several studies purporting to predict the results of parking surcharge schemes, perhaps the most revealing is a study of a program that was actually put into effect: a 25 percent surcharge on commercial parking imposed in San Francisco in 1970. According to the 1981 DOT report, a study of the effects concluded that:

- (a) the tax "had a minimal effect on traffic in the city as a whole;"
- (b) there was no data to verify any significant reduction even in peak-period central business district congestion and emissions;
- (c) only 1 in 5 trip uses actually paid off-street parking; and
- (d) "because of that and an estimated overall price elasticity for parking of -0.3, [the study] concludes that parking price increases have limited effectiveness in achieving areawide emission reductions."

(1981 DOT study at 31, citing Damian Kulash, The Urban Institute, "Parking Taxes as Roadway Prices: The San Francisco Experience," Transportation Research Record 494 (1974)).

(3) Vehicle restricted zones. NPA does not object to pedestrian mall projects in downtown areas, such as F Street in Washington, Chestnut Street in Philadelphia or Downtown Crossing in Boston. Such projects can contribute to the economic revitalization of downtown areas, and they are likely to continue to be popular for that reason.

To mandate use of restricted zones for air quality reasons, however, is another matter. That would simply re-

quire blocking off sections of downtown areas to automobile traffic, with or without any pedestrian mall-type project. That approach is likely to be counterproductive in trying to reduce emissions.

A study was conducted of the effects of restricting automobiles from an area in the central business districts of Boston and Los Angeles. With increased congestion caused by traffic diverted from the zone, it was predicted that total hours of travel would actually increase by 1 percent in Boston and more than 3 percent in Los Angeles. Further, while a slight reduction in emissions was predicted for Boston, the study concluded that in Los Angeles aggregate mobile emissions would actually increase because "the assumed lower speeds in the adjacent area of congestion caused an increase in CO large enough to offset the savings from the reduction in VMT." (DOT 1981 study at 36, citing Eugene Kroch, Harvard University, "TASSIM: An Application to Los Angeles" (1978)).

As one expert has explained:

The effect [of restricted zones] on VMT is complex.... Vehicles that formerly traveled on direct routes may be forced to take other paths. For traffic destined for downtown, this may involve the use of more circuitous routes than before, resulting in additional VMT. Similarly, traffic that formerly passed through the CBD may now find it advantageous to change routes and avoid the downtown altogether, thus adding to VMT. [Albersheim, "An Assessment of Transportation Control Measures for Improving Air Quality," Transportation Quarterly 457 - 458 (July 1982)].

(4) Restriction of roads. NPA supports the fullest possible use of HOV and restricted lanes, but opposes restriction of entire roads. Such measures are likely to be counterproductive for the same reasons as the others -- blocking access to the immediate area while merely relocating congestion and pollution to new areas.

This effect was dramatically illustrated by a study of a 1980 proposal to ban driver-only cars from entering Manhattan on four East River bridges from 6 a.m. to 10 a.m., thereby requiring these cars to use the three East River toll crossings. (Smith & Associates/Levinson, Interim Transportation Analysis, for the New York City Department of Transportation, (1980) summarized in Levinson, "Travel Restraints in

City Centers: The American Experience," Transportation Quarterly 277 (April 1983)).

The study predicted that, as a result of the substantial numbers of cars that simply diverted to the toll crossings, the plan would create line-ups of cars at the Midtown Tunnel for an additional hour each day and at the Brooklyn Battery Tunnel for an additional half hour each day. This increased congestion would obviously cause significant increases in idling time and pollution at new locations.

Further, the study found that total traffic on all 7 crossings would decrease by 3,000 cars during the peak hour of the rush period (6 - 10 a.m.), but would then increase by 4,000 cars for the 1-hour (10 - 11 a.m.) immediately following the rush period.

(5) Trip reduction ordinances. Trip reduction ordinances can include such patently exclusionary measures as "no-drive days," or the use of odd/even registration as a means of denying access to downtown areas. In many instances, these types of measures would merely encourage widespread attempts by drivers to circumvent such enforced rationing of the right to drive to downtown areas. For example, it was recently reported in the August 22, 1989 edition of Financial World magazine that an odd/even registration trip reduction measure in Athens, Greece had "spawned a frenzy of second car buying to evade the restrictions, thereby choking the city's narrow streets even more."

The lesson of these experiences is clear: because they tend merely to relocate congestion and pollution, downtown automobile access restrictions and charges are of very limited value, and in many cases completely counterproductive, in combatting emissions.

B. Targeting Downtown Traffic Is Increasingly Less Relevant

Measures targeted at keeping automobiles out of downtown areas have become, and will continue to be, increasingly irrelevant in controlling overall congestion and total vehicle travel. The reason is that population and jobs are moving to the suburbs -- and so are automobiles, congestion and pollution.

Since 1950, 86% of population growth has occurred in suburban areas, according to the definitive study Commuting in America (Eno Foundation for Transportation, 1987). The number of workers in suburbs increased from 13.5 million in 1960 to 32.6 million in 1980 -- an increase of 140%, account-

ing for two-thirds of all job increase in metropolitan areas. (Id., pp. 24, 29). These trends have continued through the 1980's. (Id., pp. 20, 25).

As a result of the shift of jobs and people to the suburbs, the "typical" suburban commuter heading downtown in his car is no longer typical. According to the Commuting in America study (pp. 5 - 6):

The predominant commuter flowpattern is now the suburb-to-suburb trip. At about 25 million commuter trips per day, it represents about one-third of all metropolitan commuting.

* * * *

The traditional commute between suburb and center city, although still growing, is not the dominant pattern. It is in fact third....

* * * *

The majority of work trip growth, 58%, occurred in suburb to suburb commuting.

* * * *

It is in the largest metropolitan areas where the suburbs are most dominant in commuting patterns.

Indeed, according to the Urban Land Institute, today the central business district commuter probably represents less than 10 percent of all highway travelers even during the heaviest rush hour. (Urban Land Institute, "Myths and Facts about Transportation Growth" (1989)).

These trends have paralleled a tremendous increase in the use of automobiles for commuting. Much of this increase resulted from a boom in the number of workers, and thus the number of commuters. (Id., pp. 28 - 29). Vehicle availability has increased, while household size has decreased, resulting in more automobiles per worker. (Id., p. 34).

At the same time, there has been a considerable shift from other travel modes to use of the private automobile (p. 7). According to the study:

Transit use has been severely affected by a number of adverse trends: increased vehicle availability per worker...; the shift of jobs to suburban destinations (which average one-sixth the level of transit use as central city destinations); and the overall lack of growth in markets where transit usage tends to be strongest (the intra-city market...) (*Id.*, p. 8).

Thus, the growth in workers and commuters is largely happening in the suburbs, and so is the shift towards greater use of the automobile. While traditional suburb-to-downtown commuting is certainly still significant, it makes no sense to mandate measures aimed exclusively at restricting, prohibiting or penalizing commuter access to downtown areas. Such measures do nothing to control the fastest-growing and most important source of automobile use, traffic and congestion -- driving within and around the suburbs. Indeed, measures that work equally well for suburb-to-suburb commuting -- such as ridesharing and employer ridership programs -- have far greater potential for reducing emissions in the worst nonattainment areas (*i.e.*, the largest metropolitan areas), where the suburb-to-suburb pattern is most prevalent.

C. Because Many People Have No Alternative, Automobile Access Restrictions and Punitive Access Charges Will Simply Shift Congestion and Pollution to the Suburbs

As noted, those who do continue to drive downtown tend to ignore or drive around restricted access routes or points, rendering them ineffective. But making restrictive measures even harsher and more punitive (*e.g.*, higher tolls or parking surcharges) will not force them out of their cars and into mass transit or carpools. Instead, it will force them to live, work and find entertainment in the suburbs -- thereby only increasing the shift of people and jobs to the suburbs, and producing more vehicle travel and congestion in new locations.

For several reasons, many people driving downtown simply cannot make use of alternatives to the single-occupancy vehicle. First and foremost is the lack of adequate mass transit in many urban areas. It hardly makes sense to mandate the use of punitive and restrictive measures to force people to use transit that is not available or that, because of crime, grime, distance from bus and subway terminals with inadequate parking, poor service or other factors, is functionally unavailable. Yet S. 1630 would require cities to include in revised plans automobile access restrictions

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and charges without regard to whether and when improved mass transit is or will be actually available.

Second, the changing patterns of commuting make alternatives to the single-driver automobile impractical for many people. With an increasing number of women heading households and households with two working parents, many people have to do a lot of other things on their way to and from the workplace -- take children to and from day care, do the grocery shopping, stop at the laundry, etc. As a result of this trend, much of the growth in automobile traffic has been in multi-destination trips, combining commuting and non-work stops.

Indeed, according to the Urban Land Institute, in 1983 the number of miles traveled to earn a living, including work-related business, was only 27 percent of daily travel in metropolitan areas. It was estimated that in urban areas of at least 3 million people, travel on the roads during the evening rush hour was almost evenly divided between commuting and non-work trips. For this variety of trips, especially combined commuting and non-work purposes, there are few if any alternatives to the private, single-occupant automobile. Further, about 8% of the working population now consists of traveling sales people, repair persons and others with no fixed place of work. Those persons, too, have absolutely no choice but to use their cars.

Third, there is often no realistic alternative to use of the automobile for the handicapped and many of the elderly. If they cannot go downtown in their own cars, they will not go downtown at all.

For people lacking good alternatives to the single-occupant automobile, the downtown automobile access restrictions and charges mandated by S. 1630 would discourage them from coming into the city at all to live, work, shop or be entertained. They will simply look for these activities and opportunities in the suburbs, thereby further spurring movement of population and jobs to those areas. That movement will ultimately create more pollution from automobiles, by increasing vehicle travel and congestion.

People who live and work in the suburbs are far more likely to use the private automobile to commute. As the Commuting in America study stated: "Commuting in the suburbs has favored use of the automobile" (p. 6). Suburban residents are also more likely to own cars than those who live in center cities: 55% of autoless households are in center cities, compared to 26% in the suburbs. And, while commuting trip lengths tend to be shorter, that trend is changing as

population and jobs in the suburbs become even more dispersed: the length of suburb-to-suburb commuter trips increased by 17.1% from 1975 to 1980, compared to 2.1% for suburb to center city trips. (*Id.*, p. 60).

In general, people use their cars more in suburbs. That use will create not only increases in vehicle miles traveled, but new and more numerous sources of relocated congestion, as a multiplicity of Tysons Corner, Virginia situations replace the "heart of downtown" as locations for the most significant concentrations of automobile traffic. By pushing more people, shops, businesses and jobs into the suburbs, where, in many instances, infrastructure does not exist to absorb rapid growth, punitive downtown access restrictions and charges will ultimately increase, not reduce, vehicle miles traveled.

D. Automobile Access Restrictions and Charges Undercut the Revitalization of Our Cities

While ultimately increasing, rather than decreasing, congestion and pollution, automobile access restrictions and charges aimed at downtown areas undercut the revitalization of our cities. If both center city and suburban residents are effectively denied access to the central business district, they will increasingly look for jobs, shopping and recreation in the suburbs. Commercial and retail businesses will leave ever faster, eroding the tax base.

The result can only be an exacerbation of the all-too-prevalent trend towards abandonment of the poorest people and the elderly --those least able to escape -- in the urban core, with an attendant increase in hard-core poverty and unemployment. And with a shrunken tax base, city governments will lack the resources for their share of needed new initiatives against drug abuse and for education. Given that revitalization of our cities is a high national priority, it makes no sense to take steps to keep people out and thereby encourage jobs and businesses to leave.

IV. Proposed Modifications

For the reasons stated above, the Federal government should do nothing to encourage, much less mandate, states to include draconian downtown automobile access restrictions and punitive access charges in revised plans. Further, with respect to all transportation control measures, states should be required to ensure adequate access to central business districts and downtown areas, and to avoid implementation of any

measure that would relocate congestion and pollution instead of reducing it.

Specifically, NPA recommends that S. 1630 be modified as follows:

(i) by deleting the word "roads [or]" where it appears in proposed Section 108(f)(1)(A)(ii) (as well as in proposed new Section 176(a)(2)(B)(ii)), so that only restriction of particular lanes, not entire roads, is mandated;

(ii) deleting the reference to "road use charges, tolls, parking surcharges, or other pricing mechanisms, vehicle restricted zones or periods" in proposed Section 108(f)(1)(A)(vii) (as well as in proposed new Section 176(a)(2)(B)(viii));

(iii) deleting "(iv) trip reduction ordinances" from proposed Section 108(f)(1)(A)(iv); and,

(iv) adding to the ordering clauses, in proposed new Sections 183(b)(4)(B) (for serious ozone nonattainment areas), 183(c)(3) (for severe and, by cross-reference, extreme ozone nonattainment areas), and 189(a) (for serious carbon monoxide nonattainment areas) the following language, which is similar to that contained in S. 1894, the bill reported by the full Committee in 1987:

In considering such measures, the State shall ensure adequate access to downtown areas and avoid measures that merely relocate congestion and emissions to other areas.

Finally, NPA favors adding to proposed new Section 108(f)(1)(A) the requirement that the information on transportation control measures to be prepared by EPA be subject to "public notice and opportunity for comment" before such information is finally issued.

CONCLUSION

Stricter emissions controls, enhanced inspection and maintenance, rapid phase-in of clean fueled vehicles and other measures will go a long way toward cleaning our cities' air. If reductions in vehicle miles traveled also become necessary, certain transportation control measures should be used. NPA favors transportation control measures that work.

Those that work will help accomplish two compatible goals -- reducing congestion and pollution, while facilitating access to downtown areas to further the revitalization of the central cities. In particular, improving mass transit is a key initiative, and one that NPA strongly supports.

Some transportation controls won't work. Automobile access restrictions and punitive access charges are ineffective. If made ever harsher, they would simply serve to relocate -- and ultimately increase rather than reduce -- congestion and pollution. At the same time, such measures will hurt our cities by further encouraging the exodus of business, jobs and people to the suburbs.

For these reasons, NPA strongly urges that Congress do nothing to encourage, much less mandate, states to impose those misdirected and self-defeating measures.

COALITION FOR IMPROVED TRANSPORTATION AND AIR QUALITY

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TESTIMONY BY THE
COALITION FOR IMPROVED TRANSPORTATION & AIR QUALITY
TO THE ENVIRONMENTAL PROTECTION
SUBCOMMITTEE OF THE
UNITED STATES SENATE COMMITTEE ON
ENVIRONMENT & PUBLIC WORKS
REGARDING S.1610 - AMENDMENTS TO THE CLEAN AIR ACT
SEPTEMBER 28, 1989

(PRESENTED BY ETHAN GETO, COORDINATOR)

EXECUTIVE SUMMARY

In September, 1986, Ross Sandler, Commissioner of the New York City Department of Transportation (DOT), proposed a "menu" of traffic control measures in order to meet Federal Clean Air standards and to reduce traffic congestion.

These proposals--banning cars in midtown, imposing a fee on cars entering midtown ("congestion pricing"), restricting single-occupant cars, restricting entry by odd-even license plate numbers and imposing additional tolls would not have materially reduced congestion or air pollution in Manhattan or the region, and would not have brought New York City into compliance with Federal Clean Air standards. Worse, these proposals would have seriously damaged New York City's and the region's economy. Indeed, Commissioner Sandler's strategies were spurned by the New York City Council, the New York City Board of Estimate and the New York State Legislature -- leading members of each of these governing bodies made it abundantly clear to Commissioner Sandler that they would not enact the enabling legislation that would be needed in order to implement these proposals.

Now that such approaches have been rejected, after careful consideration, by virtually all of the City and State elected leadership in New York, it would be a terrible setback to the New York metropolitan region if the Senate, in amending the Clean Air Act via S. 1630, was to mandate or encourage such

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counterproductive strategies. We are deeply concerned that language in Sec. 103 (b) (1) (A) (vii) would foster such economically destructive pricing mechanisms.

The goals of clean air and clear streets are worthy of a significant joint effort by government, the private sector and individual citizens. The Coalition for Improved Transportation & Air Quality believes that the Federal and City governments must act on the basis of logical, rational analysis, which has not always been the case as far as the City of New York is concerned. For example: while traffic into Manhattan is up, congestion is down--average speeds are up between 17 and 24 percent; and the number of illegally parked cars is down, all as a result of enforcement. Nevertheless, some local government officials continue to dismiss enforcement as one of the keys to making more progress.

Similarly, some New York City officials do not think that commuters can be wooed from cars by a safe, efficient mass transit system, hence the need, in their opinion, for harsh restrictions against automobile use. However, many major cities across America have proven that an efficient mass transit system reduces car use. And, finally, the current New York City Transportation Commissioner seems to think that more off-street parking means an increase in personal car use, ignoring how the City's policy of discouraging off-street parking has failed to achieve any substantial reduction in car use.

The City has been equally confused about efforts to achieve compliance with Clean Air standards. New York has a "State Implementation Plan" (SIP) specifically designed to bring the City into compliance with Federal Clean Air standards. This plan was prepared by the State and City, and approved by the Federal government, as the best approach to reducing air pollution. According to the Federal Environmental Protection Agency, if the City and the State had implemented the provisions of the SIP as they said they would, New York would now be in compliance with Clean Air standards. In particular, if New York had properly implemented its principal pollution control strategy (the proper inspection and repair of emissions control equipment on automobiles, i.e., the "I/M" program) New York would not have an air pollution dilemma coupled with the possibility of Federal sanctions. But, instead of cleaning up the air by employing the proven methods set forth in the SIP, some officials and advocates at the Federal and City level have proposed onerous traffic restrictions that are inefficient, prohibitively expensive and characterized as infeasible and insignificant in the SIP itself. Worse still, these proposals won't bring New York into compliance with Federal Clean Air standards.

Worst of all, neither the City or the Federal Government has addressed the cost/benefit ratio of any clean air "solutions." For example, an effective I/M system can reduce emissions at a direct cost of \$130 to \$1,200 per ton. These costs are

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reasonable compared with the City's proposed transportation regulations which can cost anywhere from \$5,000 to \$10,000 to remove a ton of airborne pollutants. All of Commissioner Sandler's proposals--rejected outright by other American cities as being counterproductive--were in this costly, inefficient category.

Logic tells us that the rejected traffic restrictions first proposed by the City in 1986 would not only have carried a significant price tag to implement, but they would have exacted an astronomical secondary cost from businesses and individuals. Unfortunately, this economic impact has yet to be analyzed. The City has only just begun an in-depth study of some of these issues (a study prompted in no small part by our Coalition's insistence that policy be formulated on the basis of solid data and analysis); it still doesn't know which drivers are most likely to be affected by these proposals, what businesses will do if access to midtown is restricted, or the number of dollars and jobs related to, or generated by, auto users. The City doesn't know how much congestion will be created outside the CBD by reducing congestion within the CBD. The City doesn't know how these proposals will be implemented. The City doesn't have any idea of the scope of the impact on New York's hotels, restaurants, theatres, department stores, boutiques, electronic goods stores, etc. The City doesn't even know the origin or destination of vehicles, or how many vehicles are cars in personal use as opposed to taxis or the now-ubiquitous private

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car services. What we do know is that studies from other cities that have rejected pricing mechanisms to restrict vehicular access to Central Business Districts show that overall pollution would not be reduced, costs would be high and overall traffic congestion would likely get worse.

Indeed, a top executive of the Port Authority cautioned Mayor Koch and Commissioner Sandler at a public hearing at City Hall on October 27, 1986:

More needs to be known about....Manhattan traffic before prescriptions can be written to cure congestion. What are the roles of rush-hour auto entrants in contrast with vehicles circulating in the CBD throughout the business day, for example? From which sectors of the city and the region do most of the auto commuters originate?....The vehicular access restrictions presented for discussion [by Commissioner Sandler] cannot successfully be advocated by the City...without in-depth analysis of their economic and transportation system impacts. How, specifically, would a congestion pricing system be administered and enforced? What are the possible economic impacts of restricting auto or truck access to the CBD? Could MTA services handle significant diversions of auto commuters to rail systems by 1988?....What is the optimum role for express bus services that balances market demand with the need to limit their presence on midtown streets? No one knows with confidence the answer to these questions today. Finding those answers is essential. (Emphasis added.)

The Coalition for Improved Transportation & Air Quality --comprised of leading businesses, business organizations, labor unions, civic and community groups and other members of the public--believes that data collection efforts designed to answer these questions must be completed before radical new strategies are adopted. This is a vital first step before the Federal government

or localities make policy decisions with the far-reaching implications of draconian traffic restrictions.

The Coalition recognizes that there is a congestion and air pollution problem. The Coalition would like to see progress made in both areas--real progress which continues the current five-year trend of congestion reduction and ten-year trend of pollution reduction in New York City. We are opposed to jeopardizing these trends with ill-conceived proposals that will weaken the economic and social fabric of the New York metropolitan area and metropolitan regions across the country.

To reduce traffic congestion (and related air pollution), the Coalition proposes:

1. increase law enforcement
2. improve mass transit
3. develop taxi boarding stands and encourage group-riding from the Upper East Side and West Side to the financial district
4. make commuter rail service more attractive
5. restrict commuter buses and van services in the CBD
6. reorganize bus routes
7. strictly enforce "No Standing" rules against cars in "Truck Loading and Unloading" zones so trucks are not forced to double-park
8. increase off-street parking facilities and the number of spaces in existing facilities through zoning law changes
9. impose a franchise fee and other regulations on private car and limousine services

10. encourage the use of waterways via ferry service

To reduce vehicular air pollution directly, the Coalition recommends:

1. significantly strengthen the State's emissions inspection and maintenance (I/M) program
2. shorten the time between I/M tests
3. increase the State's standards for acceptable automobile emissions
4. install gasoline vapor control systems at gasoline stations or in automobiles
5. prohibit self-administered emission inspections of taxi fleets
6. establish emissions standards for diesel vehicles
7. utilize alternative fuel sources for taxi fleets, midtown buses and city-operated vehicles

The goals of clean air and clear streets are too important to pursue in a vacuum, and in a panic. The nation's economy is at stake. The public and private sectors must work together to identify the problems and forge a rational policy to solve them.

I. INTRODUCTION

On September 5, 1986, the Commissioner of Transportation of the City of New York, Ross Sandler, presented to Mayor Koch a report entitled "An Approach To Reducing Vehicle Congestion In New York City." This report outlined a "menu" of various policy options designed to reduce traffic congestion in midtown Manhattan and the accompanying automobile-generated air pollution which threatened to cause New York to fail to achieve compliance with Federal Clean Air standards.

However, the "solutions" proposed in Commissioner Sandler's report would not only have failed to solve the very real problems of traffic congestion and air pollution, they would have had a highly negative impact on New York City's economy. This paradox served as the impetus for the formation of the Coalition for Improved Transportation & Air Quality. Our Coalition consists of many of the leading businesses and business organizations in the New York metropolitan region, as well as civic and community groups, labor unions, representatives of motorists, health services providers, the tourism and entertainment industries, real estate concerns, hotel and food industries and other members of the public. 5,000 businesses and a half-million workers in New York City are members of the Coalition.

It is the contention of the Coalition for Improved Transportation & Air Quality that radical traffic control measures will wreak havoc on the economy of the New York metropolitan region--and on similarly-situated regions or Central Business Districts nationally--and will impose severe hardship on individual citizens. Clean Air goals can and should be met wholly independent of the imposition of such extraordinary measures. Not only are there far superior methods of reducing automobile-generated pollution than those dependant on pricing commuters out of their cars, but intense efforts should also be made to restrict other, stationary sources of pollution that are major contributors to New York's dirty air. Achieving mandated air quality standards by means of drastic traffic control measures is at best the most costly approach and at worst grossly inadequate to solving the actual problem.

In sum, proposals such as "congestion pricing" will meet neither the short- nor long-term needs of the City's traffic congestion and air pollution problems and will devastate the region's economy.

II. THE CONGESTION PHENOMENON

By 1860, trends of a developing industrial city had formed into patterns of growth that would stay with New York right through to the present day. The City experienced growth in

commerce and industry which was succeeded by increases in population, which was then followed by greater demands to transport the expanded workforce to and from their places of employment. There is no mystery to this pattern. Take away growth in commerce and industry, and fewer people will be sustained by the region's economy, generating less traffic. But is shrinking the region's economy, as pricing mechanisms designed to restrict vehicular access to Central Business Districts would do, the best (or only) way to reduce traffic congestion? We think not. As a top executive of the Port Authority affirmed at an October, 1986 public hearing on Commissioner Sandler's proposals, "The unwelcome surge in congestion is largely the by-product of the very welcome economic recovery bringing new jobs, investment and tax revenue to the metropolitan area."

The number of vehicles has increased--particularly vehicles utilized by private car services--not only because of a mass transit system which until recently had suffered deterioration, but also because the metropolitan area is once again a growing economic environment attracting more businesses and people. With economic growth comes a greater demand to transport more goods and more people. Faced with a choice of an erratic, seedy subway system or crowded streets, it's no wonder people prefer to suffer above ground instead of below. As the condition of the subways deteriorated, the use of express buses, taxis, private car services and commuter vans increased dramatically. Lacking

strategies to provide for a network of balanced transportation options, serious problems have developed..

The correct strategies, properly implemented, can achieve and in one case already is achieving immediate improvements in New York's transportation system. Likewise, effective strategies already are reducing air pollution throughout the state. But these improvements need to be made with a vision of the future that embraces continued growth instead of shunning it, and by means that utilize proven methods to produce desired consequences, instead of experimenting with extreme tactics that could undermine the social and economic welfare of the citizens of New York City.

III. THE TRAFFIC CONGESTION PROBLEM

Today's traffic congestion is in part the result of a "double-think" City policy. Since the 1970's, the City has sharply curtailed what otherwise would have been a natural increase in off-street parking. The City's theory has been that less parking space would discourage motorists from coming into Manhattan.

Obviously, the City's strategy has failed miserably. Indeed, traffic volume in Manhattan has increased by nearly 30% since the City began restricting off-street parking. Why? Because the

City has been trying to discourage the wrong group of drivers. Based on the number of personal cars parked in garages in the Central Business District (CBD) and on statistics provided by the Port Authority on East River crossings, it would appear that the use of personal cars in Manhattan has not increased anywhere near the levels suggested by Commissioner Sandler. The increase in vehicles in the CBD is mainly a reflection of tremendous growth in car-for-hire services. These services can expand at will, in response to market demand, because there is no significant franchise fee or regulatory scheme similar to that imposed on taxis with medallions. Vehicles-for-hire and other commercial vehicles, not private passenger cars (the disproportionate focus of Sandler's restrictions), make up close to two-thirds of the vehicles on the road in the CBD during peak-congestion hours (11 AM - 2 PM). Better management of the vehicle-for-hire population, especially taxis and radio-dispatched cars, would greatly reduce congestion and pollution. Restrictions on private passenger cars would not reduce congestion significantly within the CBD, and would actually aggravate congestion in the outer boroughs and in Manhattan around the perimeter of the restricted area (see Sec. IV). Such restrictions additionally would adversely affect the social and economic well-being of New York City (see Sec. V).

Proper management of the vehicles that are most responsible for congestion during peak-congestion hours is doubly important

when viewed from the environmental perspective. Ozone is formed when hydrocarbons and nitric oxide are exposed to intense sunlight. Ozone (and its harmful affects at ground level) is greatest during the peak-congestion hours because it coincides with peak-sunlight hours. Better management of the vehicle-for-hire population would help to decrease hydrocarbon levels during those hours of the day when they are most harmful to our environment.

The vehicular traffic increase is even more understandable in light of the decline of the mass transit system over the past several decades. This is not to say that the managers of the subway system have not made a substantial effort to reverse this decline. Subway ridership is stabilizing and hopefully will grow. The MTA has recently reported that subway safety has been improved by the addition of 1200 transit police officers over the past two years and that cleanliness has improved by creating 200 graffiti-free stations.

Commissioner Sandler strongly implies that once you lose a subway rider to an automobile, you can never win that individual back to mass transit, and speaks of "the dominating preference for the auto." But to the contrary, it has been the long-standing view of past commissioners, the established view of City agencies and a proven fact in metropolitan regions around the United States that there is a direct relationship between an

improved mass transit system and a decrease in the use of automobiles. Felix Rohatyn, of the Municipal Assistance Corporation, told Commissioner Sandler at the October 27, 1986 public hearing that, "We can no longer afford to pretend that the traffic patterns of our major cities are separate from the maintenance of central and attractive public transportation systems." A point of fact is Washington, D.C.'s new subway which has resulted in a decrease in the use of cars that commute into the central city. The same is true of Atlanta, San Francisco and Miami. In Baltimore, the decrease in automobile use is 25%! Right here in the metropolitan area, new commuters from New Jersey, by a margin of 85% to 15%, take mass transit rather than cars. The percentage of growth in the use of mass transit among these commuters greatly exceeds the increase in the use of cars.

It long has been acknowledged that an efficient, secure and comfortable mass transit system presents an appealing alternative to automobile use. Due to improved service, tens of thousands of commuters would prefer to take the train but can't because there are insufficient commuter parking facilities at the suburban railroad stations, especially on the Metro North line and the LIRR. Expansion of these parking facilities is a perfect example of how rail can become a viable alternative to automobiles. This single improvement would achieve a greater reduction in the number of vehicles entering Manhattan than Mr. Sandler's restrictive congestion pricing plan. With this in mind, wouldn't

it be much more effective to employ a "carrot" capable of wooing passengers away from their cars rather than wielding a harsh and demonstrably unworkable "stick" to beat drivers out from behind the wheel? Now that we are being told by the executives of the MTA that the subways and the railroads at long last are on the brink of substantial improvement, is this the time to minimize--as Commissioner Sandler does--efforts to attract car users back to mass transit? As Gene Russianoff, speaking for the Straphangers Campaign, told Commissioner Sandler at the October 27, 1986 public hearing, "Better mass transit is the key to reducing auto congestion....More can and should be done to get people onto mass transit in the short run."

That there is a traffic problem in Manhattan is undeniable. However, the City's strategy of reducing off-street parking, which is premised on the idea that government can force citizens to submit to illogical and onerous policy choices (i.e., reducing parking spaces so that drivers will experience such hardships in locating affordable, convenient parking that they will retreat into an undesirable and inefficient subway system), has failed abysmally to reduce the number of cars entering Manhattan's CBD. Moreover, Commissioner Sandler says that creating additional off-street parking in the CBD to cut down on illegal parking is not feasible because construction of new facilities would be too time-consuming. In fact, additional off-street parking can be

created faster than implementing any of the Commissioner's proposals and at no cost to the taxpayers.

Existing off-street parking facilities are constrained by law to be under-utilized. Current zoning laws and municipal regulations prevent garages from accepting the number of vehicles that their physical capacity would otherwise allow. The City policy to prevent the expansion of parking facilities is obviously counterproductive. According to statistics provided by the New York City Department of Transportation (DOT), this policy has failed miserably in its stated goal to reduce the number of vehicles entering Manhattan. Its only impact has been to make it more difficult for motorists to find quick and convenient parking, and serves to drive up the cost of garage space. By making off-street parking more difficult, motorists spend more time circling the block, and the neighborhood, searching for parking. These regulations thus keep more vehicles in motion longer than necessary, adding to pollution.

Similarly, there are a slew of regulations that greatly curtail the building of new parking facilities, especially accessory facilities for both residential and commercial use. This too is counterproductive. New York has witnessed the development of hundreds of thousands of units for new living space and millions of square feet of office space in the past decade alone. However, due to ill-conceived City policy, zoning

and municipal restrictions have severely discouraged developers from providing any off-street parking. This is counterproductive for the same reasons that it is bad policy to suppress the number of available parking spaces in existing facilities. New living and commercial space attracts workers, consumers of goods and services, and residents. Some of these people must travel to these locations by car. Increasing the number of vehicles that come to a specific area while discouraging additional off-street parking for the same area is simply bad policy.

The City's policy perspective that parking spaces attract cars is patently illogical. Places of employment, theatres, health and hospital facilities, professional services, stores and other consumer attractions thankfully attract people to New York -- not parking spaces! The net result of the City's policy is that more cars are spending more time searching for less parking, adding to congestion and pollution.

Moreover, according to the DOT and in spite of the Commissioner's claims, the facts are that auto congestion--as opposed to the gross number of vehicles--in Manhattan's CBD has been declining for six successive years! During this time avenue speeds are up 24% and crosstown speeds are up 17%. Illegally parked cars in midtown are down by 61%! These improvements have been achieved despite the fact that off-street parking has decreased and in spite of the fact that according to NYCDOT there

has been an increase of 130,000 vehicles coming into Manhattan during this period.

Additionally, the City's outspoken desire to add 1,800 more medallion cabs to the streets of New York belittles the claim that traffic congestion is so bad as to necessitate the harshest restrictions imaginable. The real issue is, "What can be done to continue the six-year decrease in congestion?" We must also ask if reducing auto congestion is the most achievable or cost-efficient method of reducing auto pollution, and of otherwise coming into compliance with Federal Clean Air standards?

The single most important reason that traffic congestion has not reached a critical stage is because of the emphasis placed on aggressive enforcement of the traffic laws during the past decade, a major credit to the Koch Administration. Nearly 1,000 traffic agents and 400 vehicles have been added to the City's enforcement fleet since 1978. As a result, parking tickets have increased almost four hundred percent, to 12.5 million annually. In 1988, 99,000 cars were towed. The City has revoked hundreds of "privileged parker" permits which had been issued to diplomatic, press and government vehicles that were not necessary for conducting official business. These cars were major contributors to congestion. Despite these successes, Commissioner Sandler says that more progress in enforcement of the traffic laws would not be productive. Enough has been

costly way to achieve compliance with Clean Air standards. New York State's "State Implementation Plan" (SIP), which acquired the status of Federal law upon its approval by the Federal EPA in 1984, outlines in specific detail what New York will do to come into compliance, how it will do it and how it will keep EPA informed of its progress. The Commissioner's proposals are not incorporated in the SIP. Officials from the Port Authority, testifying at a City Hall hearing, stated that, "...the radical measures put forward for comment at this hearing would not achieve compliance with Federal Clean Air Act deadlines and standards." National experts on pollution caused by motor vehicles, who have implemented pollution control programs that have brought other states into compliance with the Federal standards, agree with the Port Authority. They say that the Commissioner's proposals would not bring New York City into compliance with Federal Clean Air standards.

It is important to note at the outset that New York's ability to achieve compliance with the Federally-mandated clean air standards is not necessarily dependent on the levels of pollution caused by motor vehicles. There are many other sources of pollution that, if they are not cleaned up, could cause New York to miss the Clean Air deadline. Stationary sources such as gas stations, asphalt paving, dry cleaners, air conditioners, etc., are major sources of the most toxic form of air pollution, hydrocarbons. But even if car-generated exhaust was the only

source of pollution, traffic control measures have such a low rate of efficiency in reducing area-wide air pollution that they could not possibly effectuate large reductions.

Federal EPA monitors New York's compliance with achieving Clean Air standards by developing computer programs that calculate the rate at which different emission sources emit pollution and a corresponding rate for a pollution control strategy that reduces pollutants in those emissions. Therefore, from a state's perspective, the process for achieving Clean Air standards is largely one of fiddling with variables in the computer program so that, on paper, the sum of the techniques which are utilized add up to the national standard. Unfortunately, this does not mean that the "paper solutions" to air pollution actually reduce the levels of emissions that are claimed in the computer.

For example, every pollution control technique, such as the NYS Department of Motor Vehicles' annual motor vehicle emission Inspection and Maintenance (I/M) program, is given credit in the computer for a percentage of the air pollution reduced during the past year. The I/M program is credited for 75% of the overall reduction in air pollution. The problem with this method is that a state can give itself credit for using a pollution control technique whether or not the state is implementing the program correctly.

For this reason, Federal EPA reserves the right to conduct actual air quality tests of pollution strategies to verify the accuracy of computer projections. Indeed, tests run by Federal EPA indicate that New York has illegally fabricated data so that it can claim credit for having implemented pollution control programs which it has failed to properly operate. A case in point is New York's seriously flawed I/M program. In a July 25, 1986 letter from Christopher J. Daggett, then the Regional Administrator of Federal EPA, to Patricia B. Adduci, Commissioner of the New York State Department of Motor Vehicles, Mr. Daggett states that he has been informed that the NYS Department of Motor Vehicles has "already considered a number of basic changes in the management of the I/M program that could go a long way towards solving the problems that have surfaced. These include:

Establishing a computerized emissions sticker tracking system that can maintain a current and accurate record of the number of stickers sold to each and every inspection station facility (this would replace the present unwieldy manual ledger system);

Changing New York State Department of Motor Vehicles (DMV) regulations to require inspection stations to strictly maintain all paper emissions test receipts in the chronological order in which they were issued;

Requiring DMV investigators to compare the number and sequence of stickers issued by stations to the number and sequence of emissions tests performed as part of the regular thrice-annual periodic visits; and

Aggressively identifying and initiating enforcement actions against inspection stations that improperly issue stickers (possibly including concealed identity investigations by DMV personnel using vehicles that are 'rigged' to fail inspection)."

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Although it was pointed out to Commissioner Sandler that New York is taking credit for pollution control techniques (i.e., I/M) that are not working at the levels indicated in New York's SIP, he defended taking credit for the I/M program as if it was working flawlessly. According to Mr. Sandler, reforming the program won't give the City any more credit on the computer, even though reforming a faulty program would result in major reductions in air pollution!

This illogical approach to dealing with air pollution was challenged by the Federal Government. Federal EPA, by conducting its own I/M spot-check on New York cars in October, 1986, determined that New York has been cheating. EPA's spot-check showed that nearly 40% of the cars in New York are not operating at (or below) acceptable pollution levels! New York, through its I/M program, should be mandating repairs to the pollution control equipment on these cars, but only 4% of the polluting cars in New York are identified and repaired each year. Thus, New York fails to identify and fix 90% of the vehicles that are not in compliance with Federal Clean Air standards! Federal EPA understandably took steps to make sure that New York doesn't continue to get credit for what the agency has termed "cheating."

While New York has come a long way in its fight against air pollution with a program that is only 1/8th as effective as it

should be, New York could continue to make major strides toward clean air if it stopped trying to achieve compliance by fiddling with variables on a computer program. Credits on a computer program do not reduce pollution, and do not achieve compliance with Clean Air standards. Reductions in air pollution ultimately are not measured by theoretical credits, but rather by actual air quality measurements. If New York upgraded its I/M and other pollution control programs, we would be at or extremely close to meeting Clean Air goals. In either case, draconian traffic restrictions that do little to clean the air, are extremely costly and place great hardship on individual citizens would not be necessary.

Over time, upgraded emission systems for all vehicles and a successful I/M program can be reasonably expected to reduce 90% of all pollutants caused by motor vehicle exhaust (in contrast to the 0-10% reduction obtainable through drastic traffic controls). Mandating reform of the I/M program could be the Federal Government's greatest contribution to achieving Clean Air goals.

In sum, a successful upgrading of emission systems and the State's Inspection & Maintenance Program could virtually eliminate carbon monoxide (70% of which is produced by motor vehicles) as well as the 50% of the hydrocarbons produced by motor vehicles. Reforms of the I/M program as specified by the

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EPA Regional Administrator could result in actual reductions of 11 tons of hydrocarbons and 352 tons of carbon monoxide per day! In California, a successfully run I/M program cleaned up 35% of the dirtiest cars on the road. This resulted in a 37% reduction in carbon monoxide and a 39% reduction in hydrocarbons, a greater reduction in pollution than is required by New York's SIP! New York, which should be cleaning up 40% of its dirtiest cars, only cleans up 4%.

These important specifics aside, it is crucial to understand that proposals to restrict personal cars would have a negligible effect on overall pollution levels. In the SIP, then-New York State DOT Commissioner James L. Larocca stated that traffic control measures developed by city and county governments aimed at reducing Volatile Organic Compounds (or hydrocarbons) could, at best, produce a less than one percent reduction in VOC emissions. Commissioner Larocca expressed (in a letter of May 5, 1983) to the Federal EPA his belief "in the insignificant effect of these measures." The SIP states that the total expected reductions in Volatile Organic Compounds emissions resulting from traffic control measures are about 1.788 tons a day, or one tenth of the reduction that would result from an effective State program of annual Inspection & Maintenance of auto emissions systems! In addition, the SIP goes on to state that "a reduction [in VOC emissions] this large could only be achieved by imposing [traffic control] measures so onerous as to make them infeasible." (Emphasis added.)

According to a 1974 study of traffic congestion in Los Angeles conducted by Harvard University, commissioned by the Office of Environment and Safety and the Office of the Secretary of the U.S. Department of Transportation, restrictions on vehicles entering L.A.'s CBD would have resulted in increased levels of carbon monoxide (CO). The report stated that while traffic congestion, and therefore CO levels, inside the CBD would be reduced, these reductions would be more than offset by an increase of carbon monoxide and congestion outside the CBD!

In short, pricing mechanisms will fail to address the true nature of the problems that do exist. Proposals to meet Clean Air standards that are not based on a meaningful analysis of all the facts or a thorough assessment of their likely consequences may prove to be counterproductive. As a spokesman for the Permanent Citizens Advisory Committee to the MTA observed at the October 27th public hearing:

It is very difficult for the community to evaluate, choose, prioritize and/or back any of these measures without evidence to show the problems have been correctly and thoroughly analyzed. An example of how flawed this analysis appears to be is that the majority of strategies are aimed at discouraging auto entries into the Manhattan Central Business District (CBD) at the morning rush, when the worst air quality problems occur in the early afternoon and are not related solely to entries. This situation could be the result of vehicles in motion all day long which are already in the CBD. (Emphasis added.)

V. THE COST OF THE PROPOSED SOLUTIONS

The economics of reducing air pollution and traffic congestion are as serious an issue as any we have addressed thus far. Who pays how much for which solution is a critical question. A serious, thorough cost-efficiency evaluation of the different methods that can be used to alleviate the problems of air pollution and traffic congestion is essential.

In 1981, a report by the Office of Environment and Safety and the Office of the Secretary of the U.S. Department of Transportation studied what the cost averages are, by region, for controlling and reducing air pollution. These estimates are based on what they believe are the most readily available methods for combating air pollution. These methods are: (1) controls on stationary sources; (2) motor vehicle emissions inspection and maintenance controls; and (3) transportation regulations.

Federal DOT arrived at the cost averages for these methods by evaluating experiences with implementing transportation control measures and modeling and predictive analyses of their effects. Also, one should keep in mind that estimates would be substantially higher in 1989 dollars.

Although controls on stationary sources, such as air conditioners and dry cleaners, are not related to motor vehicle pollution, it is still important to examine these controls for comparison's sake. On average, it costs \$1,000-\$2,000 to reduce

one ton of air pollution by mandating higher pollution control standards. Many regulations already have been placed on those who operate these sources, but more should be considered.

The costs of motor vehicle emissions inspection and maintenance controls are estimated at \$130 to \$1,200 per ton. A bolstered I/M program for New York would be dramatically cost-efficient, as it would keep new cars running at their higher standard and identify older cars in need of repair. In fact, after being hit with \$400 million in Federal sanctions, California implemented the country's most effective I/M program.

The last category is transportation regulations. All of Commissioner Sandler's proposals fall into this category. The relevant costs for reducing air pollution by these methods are estimated at \$5,400 to \$10,000 per ton! Commissioner Sandler's proposals are not only the least effective measures for reducing air pollution, they are by far the most costly. It costs between \$57,970 and \$96,800 less per day to reduce 11 tons of hydrocarbon air pollution through a sound I/M program than it would if you could reduce the same amount through the socially dislocating traffic control measures proposed by Commissioner Sandler (which you can't)!

Another area of economic consideration which seems to have been overlooked by advocates of pricing mechanisms is how much

such proposals would cost the City of New York. A thorough assessment of the importance of the personal auto to the City budget should include studies of revenues generated by auto-related expenditures and taxes which would be affected by restrictions on automobiles. Personal cars directly produce revenues through garage license fees, gasoline and auto use taxes, sales taxes on new and used vehicles, parts, service and repairs, parking taxes on private facilities, and business license fees and real estate taxes from auto-related businesses including service and repairs, garages, gas stations and new and used auto dealers. Revenue is also generated by parking meters (tens of millions of dollars per year) and traffic summonses issued by the Traffic, Police and Sanitation Departments. So far as we are aware, statistics and analysis explaining projected impacts on these revenue sources are not now available. Therefore, it is exceedingly premature to sharply curtail personal auto use without first quantifying and understanding the economic brunt of "solutions" based on severely restricting vehicular access to Central Business Districts.

Because restrictions on personal cars constitute an inefficient strategy for reducing air pollution, in New York alone hundreds of millions of dollars a year will be wasted needlessly on flawed traffic control measures. In addition, millions of dollars in revenues can be expected to be lost to the City. Further, advocates of pricing mechanisms have failed to

consider the economic effects of restricted auto access on businesses and jobs within the CBD. One must assume that such recommendations are based on the premise that the personal car serves no significant role in the City's economic life and that its use is dictated by selfish whimsy.

This is not the case. The personal car is vital to the economy of New York City and cities across the country. As explained by the President of the New York Chamber of Commerce and Industry, "Many individuals require the use of the auto and are not simply driving into Manhattan out of some perverse motivation." Most personal cars on CBD streets represent auto users who have no practical transportation alternative. Policies that discourage or hamper freedom of movement by persons dependent on personalized transportation result in detrimental economic effects. Examples of essential auto users include businessmen with multiple destinations, people transporting personal effects or sales, people with sample cases, handicapped persons for whom much of our mass transit system is inaccessible or persons who for health reasons cannot use mass transit, people living in areas poorly served by public transportation, workers or other people travelling to Manhattan at off-peak hours, carpoolers whose cost is lower than that for other forms of mass transit, and corporate executives who have schedules changing as quickly as minutes in the day. This group of essential auto users would be asked to absorb an onerous, unfair burden if

pricing mechanisms are adopted; some might even be forced to move their businesses or seek services or entertainment outside the City if legally restrained or priced out from using their auto. It is irresponsible to prompt this outcome by placing a cordon sanitaire around the inner city. According to the Real Estate Board of New York, "Over the last decade, the service sector has been the driving force behind New York's economic recovery. Incentives to retain and attract business to the City have been successful in the face of heightened competition from the surrounding region. Yet, the lure of these areas remains. While lessened mobility due to congestion might be a problem for some local businesses, we fear a more damaging effect from undue restrictions on movement."

Very little information exists to determine the extent of the relation between automobile access and the economic viability of businesses and the availability of jobs within the CBD. The last time any such studies were performed--over fifteen years ago--they showed that motorists spent \$206 million annually within the CBD for vehicle transportation services excluding tolls, fees, traffic violations, and other non-routine maintenance (expenditures that, undoubtedly, are much higher today). However, no hard information exists on the economic significance of automobile access to businesses and jobs beyond those directly connected to vehicle transportation services. How much money the auto user spends within the CBD, a meaningful

breakdown of such expenditures, and the effect of accessibility on spending power is basic information to an informed decision on whether or not to impose harsh traffic restrictions.

The relationship of auto accessibility to various forms of commercial and industrial activity in the CBD is another area in which Commissioner Sandler lacks relevant data. Data regarding reasons for car use, income levels and job profiles of car users, corporate decisions as to whether to locate within or outside the City as a function of auto accessibility, and types of businesses affected by, or dependant upon, the auto user must be obtained. In addition, information regarding the number of jobs and the amount of tax revenue generated by auto users, and dollar amounts spent and generated by them in pursuit of recreational and social activities, must be determined. Because of the enormous economic and social implications of automobile usage within the CBD, there is a critical need to obtain the required information prior to the adoption of policies ostensibly designed to tackle problems of congestion and pollution. "Solutions" to traffic problems which are implemented without this basic information may not prove to be solutions at all.

Severe restrictions on vehicular access to Central Business Districts contradict common sense. What is the logic that commands one to believe that restricting the access of personal cars to the CBD during particular hours of the day will actually

result in less total congestion in and around the CBD? The cars will still exist. A proposal such as this may very well result in creating unbearable congestion around the perimeter of the restricted area. As stated by the Port Authority, "City actions to curtail auto access to Manhattan may affect traffic levels one way or the other in neighboring communities, and their impact must be evaluated on a regional basis." (Emphasis added.) This word of caution was seconded by the Real Estate Board of New York when they said, "Suggestions such as banning cars, raising tolls and adding...toll facilities on the East River crossings will limit the movement of residents around their city and move pollution hot spots from one place to another. The City commitment to the development of the four other boroughs would be undermined by designating them as parking garages for Manhattan." Indeed, limiting personal cars in the CBD very likely would result in attracting additional commercial vehicles to fill the void left by the absence of personal cars.

These questions apply particularly to the notion of congestion pricing. To reduce traffic in one area by imposing a fee may mean sharply increased traffic in areas where the fee does not exist (shades of the Verazzano Bridge one-way toll fiasco!). These measures will undoubtedly concentrate so much additional traffic in the residential neighborhoods surrounding the CBD that soon we will receive proposals to lift the car restriction in the CBD as a means of relieving traffic

congestion. In any case, how are these types of restrictions to be enforced? Are there going to be barricades and guards that direct personal auto users away from midtown? What happens if someone in his car gets caught in midtown when the car restriction "witching hour" descends on the innocent?

Other "strategies" such as restricting single-occupant cars and restricting entries by license plate numbers seem equally naive. As pointed out by the Regional Plan Association, DOT should not try to limit congestion by "regulatory measures such as single-person car occupancy, or odd-even license plate rationing schemes, which are arbitrary, economically disruptive and difficult to enforce." How would cars entering Manhattan via the FDR Drive be turned back? Wouldn't these regulations be ignored wholesale by commuters using routes where there are no tolls? It stands to reason that these rules would further accentuate overcrowding on non-toll passages to Manhattan and would have little if any real impact on the amount of traffic, save the distinct possibility of adding to excessive congestion levels on and around access routes where toll plazas do not exist.

All of these logistical complications immediately come to mind independent of the individual hardships that inevitably will be caused by the adoption of pricing mechanisms. What will happen in the case of an emergency where someone is trying to get

to a hospital? Will we turn them around at the toll booth because they are the single occupant in their car, or because their license plate ends with an odd number instead of an even? What about people who live in Long Island and work in New Jersey or vice versa? Will we be preventing them from driving to work because they are the single occupant of their car? Will we be stopping those people who live in or around the CBD from ever using their cars because they can't afford \$200-300 per month for a "congestion sticker?" Will we be increasing traffic jams by making people pay tolls and buy congestion stickers at toll booths?

Some of these problems are very real for many Manhattan residents. At recent hearings one citizen recounted the hardships being incurred by persons living on 49th Street in Manhattan where personal and commercial vehicles are prohibited from using the streets for many hours every day. "The residents of these buildings are now denied access, for much of the day, to services which residents of other New York neighborhoods take for granted. Some of these residents are elderly and handicapped and the restrictions on private vehicles [personal and commercial vehicles] will make it difficult, if not impossible, for them to continue to live in this location."

So far as we are aware, no studies have been conducted on the effects of pricing mechanisms on major industries and businesses

such as hotels, restaurants, Broadway theatres, movie theatres and the entire retail industry from the large prestigious vendors to the multitude of specialty shops selling clothes, electronics, home and office furnishings, sports gear, computers, jewelry, etc. All of these important segments of the City's economy as well as numerous others would suffer tremendous losses if vehicle access were to be restricted. Imposing a "strategy" such as congestion pricing would deal a staggering if not fatal blow to the retail sector of our City's economy. Thousands of midtown stores, including our largest department stores, stand to lose a substantial portion of their volume if restrictions such as congestion pricing are imposed.

Further, it will be the most significant segment of retail customers--middle- and upper-income consumers from outside of the City, including residents of New Jersey, Connecticut, the northern suburbs and Long Island--who will be most discouraged by the spectre of congestion pricing. For instance, it has not been explained how persons would obtain their congestion sticker, but one can imagine a relatively simple method being devised for the daily commuter who would purchase a weekly, monthly or annual pass. But what consideration has been given to the shopper who comes to the CBD once a week, once a month or even less frequently to make major purchases? These shoppers are the people that comprise the most valued segment of the consumer market. They are the non-working spouse or other non-working

family member that is the daytime shopper, eater and matinee-goer. They are also the host of workers who have one weekday off each week and frequently use that day off to shop. These people are the purchasers of "big-ticket" items, from furniture and clothing to luxury items. They will spend extra money on a hotel room on a holiday or personal occasion. These people are valued patrons of our restaurants and theatres. How will they obtain a "congestion sticker" on a one-shot basis without being subjected to procedures that are more time-consuming for them than traffic congestion itself? It is very possible that the procedure for dispensing these stickers would end up being so confusing and time-wasting that people will develop the attitude that it is just not worth the effort to go to Manhattan to shop. Instead of projecting an image to consumers that they are wanted and welcome in New York City or other urban centers across the country, we will make people feel, "Oh, forget about shopping or going to the theatre in the City--you need a passport to get in!" Traffic control recommendations that could alienate this class of revenue would deal a devastating blow to the City's economy.

If a plan such as congestion pricing actually reduced levels of personal cars in the CBD, wouldn't it also reduce, if not destroy, the very economic vitality that makes it the Central Business District for the greater metropolitan area? Without having the benefit of credible research and data to consult, it appears that anyone's common-sense answer would be "yes."

Deterring a major portion of retail customers from spending their money in midtown would set off a chain reaction. Businesses would close down and many midtown workers would face the prospect of becoming unemployment statistics. Tourist and entertainment attractions would vanish. A now delicately-balanced and thriving New York could wind up facing a devastating economic and social upheaval.

It can be stated unequivocally that the available data on the extent of the auto's significance to the City's economy and the individual lives of its citizens is totally inadequate to support any responsible conclusions limiting automobile use. Therefore, this Coalition urges that the data collection and analysis tasks necessary to making informed and intelligent decisions about the most sensible methods for relieving traffic congestion and reducing air pollution be completed before far-reaching policies are formulated and implemented. A cost-efficiency evaluation of pricing mechanisms should be made in comparison to the proposals this Coalition will now set forth.

VI. MEANINGFUL ALTERNATIVES

It is the position of the Coalition for Improved Transportation & Air Quality that New York City should adopt a strategy that will address the immediate need for making further progress on solving the problems of traffic congestion and air pollution,

without exacerbating the short- and long-term health and well-being of New York City and its citizens. Imposing needless economic or personal hardship upon the citizens of New York is unacceptable. Likewise, hastily devised plans, developed in an unwarranted state of panic, are no substitute for performing the necessary research needed to understand which methods present the most reasonable and cost-effective approach to solving these problems while not inhibiting continued economic growth for New York. Further, we believe that public administrators, planners and engineers must recognize the fact that many of the traffic-related problems in evidence in the CBD are not due to the auto per se, but to inadequate provisions for automobile access and inadequate management and operation of surface transportation.

Since methods for reducing air pollution do not necessarily result in less traffic congestion and since methods for reducing traffic congestion do not necessarily result in cleaner air, we propose that the Federal Government carefully distinguish between solutions that are specifically geared to tackling these separate problems. Although much research is still required before thoughtful and prudent decisions can be made, we believe the following list of alternatives to be acceptable, intelligent and viable options.

VII. POLICY OPTIONS FOR REDUCING CONGESTION AND RELATED AIR
POLLUTION

- 1) Increase law enforcement. This is the single most successful method that has kept traffic congestion under control during the past five years. We must continue to use it to keep congestion under control while long-term solutions are implemented. Even with the strides made in strengthening enforcement, illegally-parked cars are still common. Improvements can be made. The Coalition echoes the concern of Federal EPA that there has been a failure in the City's management of traffic enforcement agents (TEA's). The City must increase the number and efficiency of TEA's as traffic movers at critical intersections. Particular attention should be paid to improving the flow of traffic in "hot spot" areas.

- 2) Improve Mass Transit. There is no question that this must be a top priority if we are to make real strides in reducing traffic congestion. A safe, reliable and comfortable subway would immediately remove many nonessential auto users from the roads. Further, if the subways were markedly upgraded, the City might be able to reduce bus routes, especially express bus routes, served by subway, concentrating ridership below ground and saving money.

A meaningful alternative to the coercive strategy of congestion pricing would be to lower the price of mass

transit, an incentive approach. Strategies ranging from off-peak pricing, free or low-cost bus-to-subway transfers and low-cost weekly, monthly or annual subway passes should all be seriously considered as means of recapturing the riding public for the subways.

Additional improvements recommended by the Port Authority and supported by the Coalition are:

- Replacing PATH cars with a new model that can carry more passengers and adding cars to trains.
- Redesigning the interior of the Port Authority Bus Terminal in midtown to accommodate more buses.
- Reinstating the West Shore Line from Haverstraw, NY, through Bergen County.
- Increasing the capacity of Pennsylvania Station.

Also, the Coalition is impressed with long-term studies on the viability of an overhead rail system. Such a system could provide relief to areas not adequately served by mass transit, such as the Convention Center area, without adding to surface congestion.

- 3) Develop taxi boarding stands. All traffic statistics show that the largest contributors to congestion are vehicles for hire. Better organizing of the vehicle-for-hire population would relieve congestion. Abolishing taxi cruising and establishing numerous taxi stands where passengers would board taxis would go a long way toward reducing midtown traffic without creating vehicle congestion in other areas. Taxi boarding stands should be established along selected avenues during the most congested hours of the day (11 AM to 2 PM), while banning taxi cruising in the same area. For example, between 59th and 34th streets on a major avenue (or avenues), taxi boarding stands could be created on every other block, alternating with bus stops. Between 11 AM and 2 PM, a taxi could only pick up a passenger at a taxi boarding stand. No taxi cruising would be allowed. This program, if aggressively enforced, could produce significant results. The City's ability to enforce similar policies, such as the 49th and 50th Street transitways and the "Red Zone/Bus Only" lanes on Madison Avenue, has been amply demonstrated. The City has secured widespread compliance with these concerted policies. These achievements prove that an aggressive enforcement policy on the part of the City can successfully alter the behavior of motorists. The same can and should be done with reference to taxi boarding stands.

Additionally, the Coalition supports the group-riding experiment being conducted by the Taxi and Limousine Commission and hopes this experiment is expanded to more areas of New York in the future.

- 4) Make commuter rail service more attractive. Tens of thousands of suburbanites who drive into midtown Manhattan each workday would rather take the train but can't because there are insufficient parking spaces at the suburban railroad stations, particularly along the Metro North line in Westchester County and the northern suburbs, on the LIRR and in many Connecticut townships. A crash program must be implemented immediately to expand commuter parking facilities. This single improvement would achieve greater reductions in the number of vehicles entering Manhattan than any restrictive congestion pricing plan.
- 5) Restrict commuter buses and van services in the CBD. Requiring commuter bus and van services to take routes and load and unload outside of the CBD would help to reduce traffic levels significantly. Rerouting a number of these services a couple of blocks to the east or west would not curtail their value to most riders. Stops could be coordinated with crosstown bus routes and subway stops on the periphery of the CBD. Also, it would be productive to regulate interstate bus traffic coming into the CBD.

- 6) Reorganize bus routes. Bus routes need to be reorganized. They follow routes laid out by streetcar entrepreneurs a century ago. The results are slow, little-used buses that are big money losers. Transit Authority bus ridership has dropped by 40% in the last ten years. Buses run a deficit of 74 cents per ride. Providing through service on a semi-express basis and local service on separate routes could speed service, cuts costs and free-up additional curb space for taxi stands. Reorganizing bus routes will help ease traffic congestion and pollution. Toxic emissions from motor vehicles is often greatest while idling at stop lights.
- 7) Strictly enforce "No Standing" rules against cars in "Truck Loading and Unloading" zones so trucks are not forced to double-park. Many delays in midtown are caused by vehicles illegally parked on both sides of the street and/or double-parking, drastically narrowing roadways. Preventing narrowing of the roads by strictly enforcing the rules against double-parking, would improve traffic flow in the CBD dramatically. An aggressive effort should be made to tow illegally parked cars and limousines from areas reserved for truck loading and unloading. This would prevent trucks from being forced to double-park.
- 8) Change zoning laws for off-street parking facilities. The time has come to abandon the disproved notion that parking

facilities "attract" cars to the City and therefore pollute its air. Shops, theatres, restaurants, hotels and offices attract people and their cars, not parking spaces! This "parking attracts cars" myth found its latest and most absurd expression in the decision to build a huge new Convention Center without any public parking whatsoever, in order to avoid the criticism that garages would add to pollution. As a result, despite the general success of the Convention Center, recent news media reports state that "parking may be the [one] persistent problem" that looms over the Center.

Off-street parking gets cars off the streets and increases speeds, yet currently used off-street parking facilities are forced to be under-utilized due to zoning restrictions. Changing these zoning restrictions would immediately create much-needed additional space at no cost to anyone! The Coalition urges a re-examination of the 1961 Zoning Resolution. If existing parking facilities were permitted to decrease the amount of square-foot requirements for each parked vehicle, their capacity could be increased by 25%. We urge the City Administration to support changes to zoning regulations so that a minimum number of off-street parking spaces are permitted and encouraged for all new construction (an appropriate formula might be 20% of anticipated occupancy for office buildings and 40% of anticipated occupancy for residential buildings). Further, distinctions between types

of distinctions between types of permissible uses for off-street parking facilities (accessory and public) should be eliminated, except that the law should provide that people who live or work in a building be accommodated first. Increasing available off-street parking by changing zoning regulations would get more cars off the road and thereby reduce congestion, increase speeds and help to control pollution. Fewer cars would be circling blocks looking for parking spaces and polluting the air.

- 9) Regulate private car and limousine services. A primary reason that New York has been flooded by private car service vehicles is because anyone can buy a car and start a car service. Yellow cabs are controlled by the availability and cost of medallions and franchising fees. Private car services must be similarly controlled.
- 10) Encourage the use of waterways. The City has been presented with plans for implementing a ferry or hydrofoil service between the 38th Street pier and Weehawken; Hoboken and a terminal near the World Trade Center; North Bergen, midtown and the financial district. These services are proven successes in New York and elsewhere! Estimates by the New Jersey Department of Transportation show that the 38th Street-Weehawken ferry alone could reroute thousands of commuters from roads to water transit at no cost to

taxpayers. Private developers say they could begin service within a year if the City would plow through its bureaucracy for issuing licenses for ferry service. We propose that a joint task force of the Port Authority and the City of New York be formed to cut through red tape slowing the initiation of ferry service.

VIII. DIRECT CLEAN AIR OPTIONS

- 1) Improve the I/M program. The single most effective way to reduce automobile-generated air pollution would be to significantly upgrade the State's I/M program. New York State motorists must have their cars inspected annually, including a test of each car's emission control equipment. In California, 35% of cars fail this portion of the test and inexpensive repairs are made so that the car no longer pollutes. Independent tests by Federal EPA conclude that at least 40% of the cars in New York State should fail the emissions control test each year, but only 4% fail! Federal EPA has determined that New York City's major carbon monoxide and hydrocarbon problem is largely a result of the failure of a functioning I/M program! Clearly, New York's I/M program is not identifying polluting cars nor mandating their repair. All available evidence shows that an improved I/M program would be the most cost-efficient and effective method for making immediate and substantial gains in the reduction of automobile-generated air pollution in New York City. Real

progress in this area would virtually eliminate the need for implementing other pollution control measures on motor vehicles (such as traffic controls).

- 2) Shorten time between I/M tests. There is nothing sacrosanct about testing auto emission systems once a year. Requiring cars to be tested every six months would keep those cars that break down shortly after testing from polluting the air for close to a year. Vehicles built after 1970 were required by Congress to be built with pollution control equipment. By 1980, pollution control equipment became so advanced that, with very few exceptions, cars built after 1980 emit 90% fewer pollutants than cars built before 1970. However, when the pollution control equipment breaks down on new cars, they pollute as badly as the pre-1970 uncontrolled vehicles.
- 3) Toughen New York's standard for acceptable emissions. A fair way of sharing the burden for cleaning the air would be to require all vehicles to meet a higher emissions standard. California implemented a higher standard and the result has been a marked increase in air quality.
- 4) Gasoline vapor control systems. Gasoline vapor recovery systems which capture gasoline vapors instead of letting them escape into the atmosphere should be required by the State. These systems are currently available for motor vehicles and

gasoline stations. Uniform federal standards would be a large step toward a regional solution for ending this source of pollution.

- 5) Prohibit self-administered fleet inspections. Private car services and taxi companies which have fleets of cabs are allowed to perform I/M testing in-house. These vehicles constitute the vast majority of the vehicles in motion. Because of the lack of control mechanisms on testing equipment (such as the ability to abort a test if the vehicle looks like it will fail), fleet owners should not be allowed to conduct I/M testing on their cabs. Rather, these vehicles should be inspected independently.
- 6) Establish emission standards for diesel vehicles. Establishing emission standards for diesel buses and trucks would help to reduce the 3,000 tons of pollution they spew into the air of New York City every year. As things are now, many diesel vehicles don't have to be tested. This should change. (Those companies that have voluntary emissions inspection programs already in place should be allowed to continue the programs, with independent monitoring.)
- 7) Use alternative fuels. The exhaust of unused fuel from the combustion process results in air pollution. Some fuels burn in a cleaner fashion than others and, therefore, are more

efficient and safer to use. Fuel switching is an important way to reduce pollution from automobile exhaust (and manufacturing plants). The use of alternative fuels in City- or State-operated vehicles is becoming increasingly popular across the country. The current state of the technology makes it a safe, effective and cost-efficient method for achieving large reductions in hydrocarbons and carbon monoxide. The City has well over 50,000 vehicles under its control. Experts say that switching just one-quarter of these vehicles to cleaner fuels would result in a tremendous reduction in automobile-generated air pollution.

- 8) Develop taxi boarding stands. Abolishing taxi cruising would not only help to cut down on traffic congestion, it would also help control pollution. Vehicles in motion without a destination, e.g., private cars looking for parking spaces and taxis cruising for passengers, contribute more to CO pollution than vehicles with a fixed destination.

IX. CONCLUSION

The goals of reducing traffic congestion and air pollution are worthy of a substantial effort by government, the private sector and the public at large. Because of the importance of these goals, a meaningful analysis of the problem is needed so that workable solutions can be developed. Unfortunately,

proposals such as pricing mechanisms will cause more damage than they will repair.

Most of the recommendations set forth by the Coalition can be enacted through the City's own authority and, therefore, initiated within a short time period. Moreover, the only proven options for reducing automobile-generated air pollution have been presented by this Coalition ^{in Sections III and VIII of this testimony} under the heading, "Clean Air Options"; otherwise, the air pollution problem must be addressed by reducing non-automobile sources of pollution, such as those caused by industry, gas and electric utilities, commercial chemicals and other common sources.

One stipulation placed on possible solutions by New York City DOT Commissioner Sandler was that each option should be "significant enough to bring about a substantial reduction in travel patterns as measured by vehicles in motion, vehicle entries, vehicle miles travelled or speeds." There is only one sure way to live up to this stipulation without causing chaos throughout the City of New York. Most everyone is well aware of what it is: make mass transit a real alternative means of transportation. Coupled with short-term measures such as taxi boarding stands and greater law enforcement, the City has all the available means to make immediate and permanent strides towards solving traffic congestion.

Another guideline set forth by Commissioner Sandler is that all recommendations "should minimize adverse social and economic impacts." Yet in every instance reviewed, it has been shown that this criterion is the most frequently abused by the pricing mechanisms favored by Commissioner Sandler and some in Washington. Socially and economically dislocating strategies are being proposed and the research needed to avoid causing irreparable harm has not been done. As stated by the Port Authority in its critique of pricing mechanisms designed to restrict vehicular access to New York's Central Business District, "Even the radical measures put forward for comment at this hearing would not achieve compliance with Federal Clean Air Act deadlines and standards....Manhattan is the economic heart of an increasingly interdependent metropolitan region, through which people and goods must flow efficiently every day. We can think of the Manhattan traffic problem as the region's heart condition, and the crafting of new transportation plans for the Central Business District as open heart surgery. The task must be approached with care, and the policymaking carried out with a scalpel rather than a saw." (Emphasis added.)

Now it is up to the United States Senate to adopt revisions to the Clean Air Act which will advance the crucial goal of cleansing the air we breathe while not shutting the doors on our nation's cities to millions of commuters and consumers.

STATEMENT OF

Tom DeLoach

ON BEHALF OF THE
AMERICAN PETROLEUM INSTITUTE

BEFORE THE
SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE
ON
PROPOSED AMENDMENTS TO THE CLEAN AIR ACT

WASHINGTON, D.C.

September 28, 1989

Introduction

Good morning. My name is Tom DeLoach and I am Vice President of Marketing for the U.S. Marketing and Refining Division of Mobil Oil. I am pleased to appear here today on behalf of the American Petroleum Institute to address several important issues regarding motor fuels and air quality. The American Petroleum Institute (API) represents over 200 companies engaged in all aspects of the petroleum industry. API's members have been active in the research and development of various oxygenated blends and alternative fuels. As major manufacturers and sellers of motor fuel, API's members have a vital interest in legislation concerning all automotive fuels, including oxygenated fuel blends and alternative fuels. No matter what fuels are used in the future, API's members are likely to be involved in their production and sale.

Today, I will discuss carbon monoxide (CO) nonattainment problems and the use of oxygenated blends. Then, I will comment on proposals to implement alternative fuels programs to reduce ozone concentrations. However, first I would like to stress the continuing commitment of the petroleum industry to improving the quality of our air.

Considerable progress has been made in reducing emissions from both fuels and vehicles and there is every reason to believe such progress will continue. CO emissions are decreasing rapidly with fleet turnover and this has brought about a significant reduction in both the number of nonattainment areas and the degree of nonattainment in those areas. As a result, the longer term CO problem applies to just a few areas and we therefore believe design and implementation of any oxygenated blends programs are best left to individual CO nonattainment areas to tailor programs to their specific needs as proposed in S. 1490. S. 1490 provides these areas with the flexibility to select the oxygenate(s) of their choice. In this fashion, they can consider the severity of their problem, sources of CO emissions and alternative solutions. S. 1630 would mandate ethanol by requiring a 3.1% oxygen level. This will restrict consumers' fuel choices and is unlikely to be cost-effective.

Although the number of CO nonattainment areas has decreased, ozone nonattainment remains a persistent problem and we recognize the need for additional control measures. Since EPA estimates that mobile sources represent between 30 and 50% of urban inventories of volatile organic compounds (VOCs), it is appropriate to consider policies affecting both vehicles and fuels with consideration for the most cost-effective solutions. Regarding alternative fuels, we remain concerned that mandatory programs, such as that contained in S. 1490, when implemented by EPA will be primarily methanol programs and will impose substantial costs on consumers and the nation without realizing commensurate air quality benefits.

We believe performance standards should be set and all fuels and vehicles which can meet them should be allowed to compete in the market. This will ensure that the most cost-effective fuels and vehicles prevail. We believe reformulated gasoline can be one of those fuels, however adequate time must be provided to fully explore the potential of all promising fuels including both methanol and reformulated gasoline.

Many important questions remain concerning alternative fuels and it is important to avoid precipitous actions before a comprehensive assessment of all alternative fuels can be completed. Only then, can wise public policy decisions be made and cost-effective programs be developed.

Oxygenated Blends As a CO Reduction Strategy

Oxygenated blend programs have been proposed to help bring CO nonattainment areas into compliance. However, the CO problem is diminishing as newer cars with advanced emission and engine controls replace older, higher polluting cars. Between 1978 and 1987, EPA estimated that CO emissions were reduced by 32%. During that same period, the CO contribution from highway vehicles decreased by 38%, despite a 24% increase in vehicle miles traveled. Data from EPA indicate that the number of CO nonattainment areas is continuing to decline, dropping over 30% in the last two years. Most CO nonattainment areas are likely to reach attainment in the near term without imposing an oxygenated blend program.

Further, programs already have been developed in many of those CO nonattainment areas which might benefit from the use of oxygenated blends. Thus, a requirement, such as that contained in S. 1630, that an oxygenated blend program be implemented in all CO nonattainment areas is not justified.

Newer cars show little, if any, CO reductions from use of oxygenated blends. Thus, oxygenated blend programs will clearly result in diminishing returns due to vehicle fleet turnover. While oxygenated blends can reduce CO emissions in older cars (pre-1981), most of the CO reduction can be achieved at a 2% oxygen level. And, the 2% level would allow other oxygenates such as MTBE, and other ethers such as ETBE, to compete in the marketplace.

If greater ethanol use is required, by S. 1630, substantial new investments would be necessary to make the entire motor fuel distribution system water-free. Ethanol-gasoline blends separate in the presence of water. Therefore, if ethanol blends were to be shipped by pipeline, some way would have to be found to address the water problem and retrofits would be required for insuring against water contamination in storage tanks. Ultimately, the costs associated with a widescale ethanol mandate would be borne by consumers. Also, if an ethanol mandate were imposed on all CO nonattainment areas, additional ethanol

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capacity would need to be built despite the fact that demand for it could begin to decrease as fleet turnover brings nearly all CO nonattainment areas into compliance in just a few years.

A federally-imposed program will restrict the flexibility of state and local governments to design the most cost-effective programs for their areas. Instead, those areas should simply be directed, as S. 1490 does, to develop programs specifically tailored to their own local conditions -- programs which should retain a choice of fuels for consumers.

Alternative Fuels As An Ozone Reduction Strategy

Alternative fuels are frequently described as those fuels which could be substituted for conventional gasoline, including methanol, ethanol, LP gas (LPG), compressed natural gas (CNG), reformulated gasoline, and other power sources such as electricity. No currently practical fuel or vehicle by itself is inherently clean. Rather, it is the combination of fuel and vehicle together over many miles of operation which must be considered to fully understand the impact on ozone formation. Further, the performance of alternative fuels and vehicles must be compared with the most advanced gasoline vehicles currently being marketed. When viewed in this light and based upon all available emissions and performance data, there is no one fuel/vehicle combination that arises as the solution.

We do however want to focus primarily on reformulated gasoline and methanol because they are the most likely candidates for widespread use. CNG and LPG have potential to improve air quality, but their use is more likely to be limited to a particular segment of the market, such as centrally fueled fleets.

In evaluating alternative fuels and vehicles, it is imperative that consumer interests be taken into consideration and that all fuel/vehicle combinations be given a full and fair assessment before any alternative fuel/vehicle program is implemented. Further research and testing are needed to fully understand the impact of such fuels and vehicles on ozone under conditions of actual use, in various climates, and over the life of the vehicle. And, a complete analysis of all the costs associated with such a program must be conducted to ensure that the nation's resources are not squandered on a program that is not cost-effective. In any such analysis, consideration must be given not only to their air quality impact, but also to the important health and safety, energy security and supply, and economic impacts associated with various alternative fuels.

Several basic principles must be incorporated in any consideration of alternative fuels and vehicles:

- Adequate time must be provided to evaluate all of the most promising fuel/vehicle combinations.

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- Precise criteria, which do not discriminate between fuels should be established and a formal rulemaking and hearing process should be followed to ensure participation by interested parties in the development of any alternative fuel/vehicle program.

- The Departments of Energy and Transportation should be full partners with EPA to address other major concerns such as energy security, vehicle performance and safety and cost considerations.

- All competitors who manufacture vehicles or market or supply fuels should be treated equally.

None of these principles are currently reflected in the mandatory alternative fuels program imposed by S. 1490 (nor are they adequately addressed in the fuels specifications provisions of S. 1630).

Emissions and Potential for Ozone Reduction

There has been significant improvement in controlling motor vehicle emissions. Data collected by the California Air Resources Board (CARB) for 1986 certification tests for gasoline vehicles indicate that 82% of all engine families were below the .25 hydrocarbon tailpipe standard being imposed in California beginning in 1992. In addition, EPA has required reductions in gasoline volatility.

Nevertheless, ozone nonattainment remains a difficult problem. Alternative fuels and vehicles, particularly methanol, are being advocated as an ozone reduction strategy. Yet, there are great uncertainties about actual in-use emissions and their ultimate impact on ozone formation. Such uncertainties must be resolved before informed public policy decisions can be made.

O Emissions

A recent report, "Potential Emissions and Air Quality Effects of Alternative Fuels" by Sierra Research compared emissions from gasoline and methanol vehicles and concluded that the emissions control performance of methanol vehicles is not as good as that being achieved by current gasoline vehicles with advanced emissions control systems.

Methanol has been cited as a possible ozone control measure since it could replace some more photochemically reactive hydrocarbon emissions with less reactive emissions of unburned methanol. A more relevant question concerns the emissions of formaldehyde which are a product of methanol combustion and are highly reactive in forming ozone. Much will depend on whether formaldehyde emissions control systems can be developed and maintained over the vehicle's life. S. 1630 addresses concerns about formaldehyde emissions by requiring performance standards to be set for formaldehyde emissions from alternative fuel vehicles.

Emissions testing has indicated that methanol-fueled vehicles produce 3-5 times more formaldehyde than conventional gasoline vehicles. Furthermore, these measurements are generally from low-mileage and well-maintained vehicles and are likely to underestimate typical in-use emissions. Methanol vehicles, particularly the more technologically advanced, have generally not accumulated sufficient mileage in actual consumer use to accurately predict their emissions over the life of the vehicle. This is important since emissions control generally deteriorates as mileage increases and formaldehyde emissions in particular have been shown to increase substantially with mileage.

CARB recently adopted a formaldehyde standard of 15 mg/mile for methanol vehicles for 50,000 miles. Automakers have stated that they do not know how to control formaldehyde to this level in actual consumer use over the life of the vehicle. If technology is developed to improve formaldehyde control for methanol vehicles, it will likely be applicable to further reducing emissions from gasoline vehicles.

In addition, methanol vehicles can emit more nitrogen oxides (NO_x) -- another significant ozone precursor -- than gasoline vehicles. Sierra Research concluded that:

"At the current state of emissions control technology development, gasoline-fueled vehicles have achieved more than 50% lower NO_x emissions and equivalent or lower hydrocarbon emissions (as computed by EPA), compared to methanol-fueled vehicles."

Evaporative emissions from dedicated methanol vehicles (designed to operate on 100% methanol) could be less than gasoline vehicles due to the lower vapor pressure of neat methanol. However, such a vehicle is at best a prototype with no near term viability. The vapor pressure of M85 -- the most likely methanol fuel to be used in a so-called flexible fuel vehicle (FFV) -- is comparable to gasoline. And, evaporative emissions could be a more significant problem for FFVs which are designed to permit switching back and forth between gasoline and methanol. This switching commingles the fuels in the tank resulting in a mixture with a higher volatility than either fuel alone.

There is no reason to expect that methanol vehicles will have lower emissions than gasoline vehicles and current FFV test data bear this out. In addition, gasoline vehicle emissions could be substantially reduced due to further development of automotive technology to control evaporative and running losses as well as from the use of reformulated gasoline. Also, reformulated gasoline not only has significant potential as the fuel for future vehicles, it, unlike other alternative fuels, can probably reduce emissions significantly if used in existing cars.

Methanol's emissions must be compared to emissions from the best technology, conventional gasoline-fueled vehicles to determine what potential benefit, if any, methanol can offer. For example,

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recent work by GM suggests that the benefit from methanol vehicles could be less than some had previously suggested. The GM study, unlike most others, compared methanol vehicles to advanced technology gasoline vehicles and found the emissions from these gasoline vehicles to be up to 25% less reactive than previously assumed, leading GM to conclude "... current experimental methanol-fueled vehicles provide, at best, small ozone reductions compared to prototype gasoline-fueled vehicles."

Arco's EC-1 (for pre-1975 cars) is one example of what might be possible with gasoline reformulation. Reformulations for today's best technology vehicles are also likely to prove beneficial. Development and testing of various types of fuels, and vehicles with advanced emission controls, is needed to understand the emissions and ozone reductions which may be possible -- as well as the costs. Reformulated gasoline will not be without cost and significant changes in refinery operations may be necessary. Also, some reformulations may require substantial new investments, and time to design, permit and construct, additional refinery processing equipment.

We are developing research to better determine the promise, and cost, of reformulating gasoline and modifying gasoline vehicles' engine and fuel systems to reduce emissions. These results will be compared to the use of methanol and other fuels so that the most cost-effective ozone strategies can be identified. Although we are moving quickly, thorough research will take time. This is why we are so concerned with the alternative fuels program in S. 1490 and its requirement that performance standards for those fuels be set within 12 months of enactment. S. 1490 also leaves almost unlimited discretion to the EPA Administrator to set those standards.

Twelve months is simply not enough time to accurately and fairly assess the most promising alternative fuels, including reformulated gasoline which still must be developed and tested. In addition, much more work needs to be done on methanol vehicles to determine if actual performance can be brought up to projected performance over the vehicle life. Available data is largely based on a small number of prototype vehicles with limited mileage.

A full and fair assessment of all alternative fuels is particularly important in light of the predisposition of many at EPA toward methanol as reflected in the overly generous emissions credits attributed to methanol in their guidance document and recently issued special report on methanol.

While S. 1630 avoids a mandatory alternative fuels program, it requires that EPA establish national fuel quality specifications which, to the extent they are economically and technically achievable, will reduce vehicle emissions. However, S. 1630, does not provide adequate time nor precise criteria for the type of research and testing that is necessary since it requires

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standards to be set 18 months after enactment. We urge that this timeframe be reconsidered. In addition, we are opposed to a provision in this section of the bill, which provides EPA with broad authority to regulate refiners, distributors, marketers and consumers.

o Ozone Impact

Modeling the impact of emissions on ozone is obviously highly dependent on the assumptions used. A look at a number of modeling studies of the impact of methanol use on ozone shows a clear trend with the more recent studies projecting a smaller reduction in ozone.

Even studies using very optimistic assumptions do not show large decreases in ozone -- and, if adjustments were made to incorporate more realistic assumptions, these ozone decreases would be even smaller. A recent study by Carnegie Mellon University predicted a 9% decrease in ozone in 2000 and 6% in 2010, if all cars in the Los Angeles area used pure methanol (M100). However, this reduction also assumes emission reductions from the shutdown of all refineries in the area and assumes that formaldehyde emissions from methanol vehicles are one-tenth or less (3 mg/mile) than levels currently achieved by these vehicles. This 3 mg/mile level would require over 99% control of engine-out formaldehyde levels and is only a small fraction of the CARB standard of 15 mg/mile which auto manufacturers say is unattainable with current technology.

A recent 20 city study by Ford showed clearly how ozone reductions vary from city to city depending on local conditions (VOC/NO_x ratio) -- with reductions projected for the year 2000 of only up^x to 5.1% in peak ozone in the city with the largest impact, assuming formaldehyde were controlled to a degree not now possible. For the 20 cities, ozone reductions average only 1.3% for M85 and 2.6% for M100 if there were 100% substitution of methanol in light duty vehicles. A recent GM analysis also showed the importance of local air quality conditions. GM's analysis predicts that certain areas with high VOC/NO_x ratios, such as Houston, "will not realize any ozone reduction by introducing methanol-fueled vehicles."

Such uncertainties highlight the need to:

- obtain better emissions data from both methanol and advanced technology gasoline vehicles under conditions of actual use;
- develop a more accurate emissions inventory for the most serious nonattainment areas where an alternative fuels program may be considered; and
- evaluate alternative fuels programs on a city by city basis using the best modeling techniques available.

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At present, it appears that flexible fuel methanol vehicles may not provide much of an air quality improvement compared to the best of today's gasoline vehicles. Since methanol's projected benefits are variable and uncertain, it does not appear to be an effective nationwide ozone strategy.

o Cost-Effectiveness

The cost-effectiveness of methanol for reducing ozone will depend on many factors, particularly in use emission levels, local air conditions, vehicle technology, and the price difference between methanol and gasoline. However, in most situations, it seems that any air quality improvement from methanol will come only at extraordinarily high costs, typically exceeding tens or hundreds of thousands of dollars per ton of equivalent VOC removed. As a point of reference, the usual norm in EPA regulatory decisions is about \$2000 per ton.

A recent OTA report which used very optimistic EPA projections of substantial VOC reductions from methanol, concluded that a methanol program could cost almost \$40,000 per ton of VOC removed.

A complete evaluation of the cost-effectiveness of various ozone reduction strategies based on a comprehensive emissions inventory for each nonattainment area is necessary. Such an evaluation may well show enhanced inspection and maintenance programs, accelerated retirement of older cars and reformulated gasoline to be more cost-effective strategies.

The performance standard approach of S. 1630 could encourage vehicle and fuel manufacturers to provide the lowest cost combination of fuel and emissions control technology to meet air quality goals and satisfy consumers' vehicle performance needs. However, we remain concerned that S. 1630 requires EPA to set fuel specifications and performance standards before adequate time is given for research and testing.

Health and Safety

Different fuels present different health and safety considerations. The challenges for the safe handling of gasoline are well-known given our long experience and the careful development of safety procedures.

The widespread distribution of methanol, however, presents a number of health and safety concerns. Methanol is highly toxic when ingested -- even small doses can result in blindness or death. It is colorless, burns without a flame, and is relatively odorless and tasteless, raising concerns about detection. Methanol is completely soluble in water and moves easily through soil to groundwater, making drinking water contamination another concern.

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Symptoms of methanol poisoning are often delayed in appearing and diagnosis is difficult. Data from the American Association of Poison Control Centers on accidental methanol and gasoline exposures show that even though 75 times more gasoline is used in the U.S., there are more deaths and injuries from methanol. The 1987 fatality rate for methanol exposure was 25 times greater than gasoline despite the fact that neat methanol is mostly used in commercial applications with limited consumer access.

Further, methanol can be readily absorbed through the skin and methanol/gasoline mixtures penetrate the skin even faster. This means poisoning could result from misuse as a solvent or cleaner or from spilling methanol on clothing while refueling.

Although methanol's acute toxicity is well known, there is little information about the effect of long-term chronic exposure to methanol. Further, the potential for higher concentrations of formaldehyde -- a probable human carcinogen -- in enclosed spaces such as tunnels or parking garages as a result of methanol vehicle emissions must also be explored.

Such concerns recently prompted the California Trucking Association, the California Manufacturers' Association and others to petition EPA to initiate methanol testing under Section 4 of the Toxic Substances Control Act to better evaluate these risks before introduction of methanol for widescale use.)

Energy Supply

Widespread use of methanol would require a large increase in methanol production capacity. The Administration's program, as incorporated in S. 1490, would necessitate the building of as many as 22 new methanol plants, at an estimated cost of \$6.6 billion. These new plants would most likely be located overseas since foreign natural gas will probably remain the lowest cost feedstock for methanol production for some time to come. More than three-quarters of the world's surplus exportable natural gas is located in the Soviet Union and OPEC nations, particularly the Middle East. Thus, U.S. dependence on foreign energy sources would escalate as we would become more dependent on a finished product without domestic manufacturing capability. This would export U.S. jobs and worsen the trade deficit.

Methanol's lower energy content will require a substantial and costly expansion of the nation's motor fuel distribution system. Methanol fuel will take us only about half as far as the same amount of gasoline. Therefore, widespread methanol use would require nearly twice the capacity in the motor fuel distribution system. More tankers, trucks, barges and railroad cars would be needed to move methanol and more storage tanks at both terminals and service stations would be needed. If methanol were to be shipped by pipeline, pipelines would have to be enlarged or new ones built.

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In addition, methanol's physical properties will require significant modifications to the existing distribution system. Since, unlike gasoline, methanol readily dissolves in water, the entire distribution system would have to be made water-free. Some way would have to be found to address the water contamination problem in pipelines and storage tanks. Further, methanol is highly corrosive. Thus, valves and seals for pipelines and pumping stations may have to be replaced as well as service station storage and distribution systems which are not compatible with methanol. Since methanol is considered a hazardous substance under RCRA, secondary containment would be required for underground storage systems at service stations selling methanol.

Summary

It is important that these concerns be thoroughly addressed and a fair assessment of all fuels made to ensure that the most cost-effective air quality improvement strategies are pursued. For all the reasons stated above, the mandatory alternative fuels program developed by the Administration, and included in S. 1490, is unlikely to be a cost-effective ozone reduction strategy particularly if methanol fuels are favored. EPA's predisposition toward methanol ignores serious health and safety and energy security issues as well as significant uncertainties about emissions from methanol vehicles.

The oxygenated blends mandate in S. 1630 is unnecessary and will not prove to be a cost-effective CO reduction strategy. Instead, the flexibility for state and local governments to design programs best suited to their individual needs should be retained.

Thank you for this opportunity to comment on these important issues.

9/27/89

WRITTEN TESTIMONY OF
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VICE PRESIDENT, MARKETING DEVELOPMENT
COLUMBIA GAS DISTRIBUTION COMPANY
OF COLUMBUS, OHIO
ON BEHALF OF
THE AMERICAN GAS ASSOCIATION
AND THE
NATURAL GAS VEHICLE COALITION
BEFORE THE
SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE
ON THE USE OF
ALTERNATIVE FUEL VEHICLES

September 28, 1989

INTRODUCTION

The American Gas Association (A.G.A.) is a national trade association composed of some 250 natural gas distribution and transmission companies serving over 166 million natural gas consumers throughout the United States.

The Natural Gas Vehicle (NGV) Coalition is made up of 59 members, including natural gas distribution companies, pipelines, producers, automotive equipment and vehicle manufacturers, natural gas vehicle users, environmental organizations, educational institutions, and other organizations interested in commercializing natural gas as a vehicle fuel. The NGV Coalition is dedicated to promoting and stimulating the use of natural gas as a vehicle fuel, supporting the development and implementation of federal and state policies that encourage the use of natural gas as a vehicle fuel and commercialization of the natural gas vehicle market and the natural gas vehicle industry.

A.G.A. and the NGV Coalition appreciate the opportunity to comment on Clean Air Act amendments that would involve federal government actions to expand the use of alternative fuels in the U.S. transportation market. The Alternative Motor Fuels Act of 1988 was an important step toward

providing manufacturers with an incentive to produce alternative fuel vehicles and stimulating demand for such vehicles. We believe this law provides an important foundation on which to improve air quality by promoting the expanded use of NGVs and other alternative fuels vehicles.

NGVs can deliver important benefits to the American people, and we have the gas supplies to fuel those vehicles. As mandates and incentives are initiated at both the state and federal levels, NGVs should be allowed to compete with other alternative-fuel vehicles fairly in serving the transportation needs of our country with a balanced fuel mix.

In August of 1988, the Department of Energy released "Progress Report Two: The International Experience" as the second volume of its multi-volume study, Assessment of Costs and Benefits of Flexible and Alternative Fuel Use in the U.S. Transportation Sector.

This DOE study surveyed the actual experience with alternative-fuel vehicles in several different countries that are pioneers in the field.

The DOE study shows that, of all the alternative-fuel vehicles being used throughout the world, more than half are running on gaseous energy.

Our testimony will show that this is no accident. Natural gas vehicles offer a wide range of benefits for

their customers and for the public in general. It is no wonder they are popular.

Natural gas vehicles can be popular in this country, too -- if public policy decision-makers will include them in air quality planning and permit them to compete on their own merits against other alternative-fuel vehicles. It is against this backdrop that our testimony will focus first on our many concerns with S. 1630 and the improvements we believe necessary to achieve its laudable environmental goals. Then, we will expand upon the many environmental advantages offered by natural gas vehicles and the role NGVs can play in an aggressive federal alternative fuels program.

CONCERNS WITH VEHICLE PROVISIONS OF S. 1630

The Need for an Alternative Fuel Program

It is clear that the drafters of S. 1630 put much time and effort into this CO/ozone nonattainment measure. From our perspective, however, it offers an incomplete prescription for addressing the very serious consequences of poor urban air quality. It is incomplete because it ignores -- apparently by design -- the substantial contributions natural gas vehicles can make in cleaning up our environment. S. 1630 provides no program to increase the use of alternative fuel vehicles, either passenger vehicles or urban buses. This is in sharp contrast with S. 1490/H.R.

3030, which would require the manufacture/sale of up to one million alternative fuel vehicles per year by 1997. The two other CO/ozone nonattainment bills pending in the House, H.R. 99 and H.R. 2323, also contain alternative fuels programs that would require fleet acquisitions of alternative fuel vehicles. Unless S. 1630 is amended to include a program to increase the use of alternative fuel vehicles, it cannot hope to achieve the kind of emissions reductions necessary to provide relief to our urban nonattainment areas.

In addition to the extremely ambitious mandate for clean fuel vehicles, S. 1490/H.R. 3030 also would require that the 41 most polluted urban areas, when purchasing new buses, purchase only clean fuel buses by 1994. This requirement will greatly reduce pollution from one of the major urban contributors to poor air quality -- diesel buses. This kind of bus program, when coupled with incentives for alternative fuel vehicles, can provide substantial clean air benefits, including reductions in carbon monoxide, carbon dioxide, reactive hydrocarbons and particulate matter.

By contrast, S. 1630 offers none of these environmental advantages and could lead to the adoption of onerous measures in state implementation plans for nonattainment areas resulting in major lifestyle changes for residents of

those areas. These changes could go well beyond the kind of carpool incentives envisioned long ago when the Clean Air Act came into being. These changes could to to the very essence of the way we live, work and enjoy leisure activities. As S. 1630 now stands, Americans could be required to make sacrifices in their daily lives that would not be necessary if S. 1630 provided a complete comprehensive blueprint for cleaner air that included a program to increase the use of alternative fuel vehicles. There would also be a salutary effect of promoting use of an abundant and overwhelmingly domestic resource -- natural gas -- in the vehicular sector that today is increasingly reliant upon imported oil.

The Need to Regulate Hydrocarbon Emissions Under a Nonmethane Hydrocarbon Standard

S. 1630 would establish a nonmethane hydrocarbon standard, but would require compliance with such a standard in addition to a total hydrocarbon standard, for light-duty vehicles. Moreover, the nonmethane hydrocarbon standard would be eliminated after the year 2002. We believe that this is an inappropriate environmental policy.

The goal of hydrocarbon reduction is to improve ozone levels. Ozone is produced by a chemical reaction of hydrocarbons, nitrogen oxide and sunlight. Hydrocarbons are not a single chemical but rather a large family of chemicals

that participate in ozone production reactions, to varying degrees. Some of these chemicals are highly reactive, while others are virtually inert. The best possible regulatory program would weight each hydrocarbon species according to its reactivity.

Given the monumental research effort that would be required to gain such reactivity information on each of the thousands of hydrocarbon species, the appropriate regulatory goal could be simplified by establishing only two categories of hydrocarbons: reactive and non-reactive. Under this regulatory scheme, all but the extremely photochemically inert compounds would be considered reactive. This restructuring of the standard for hydrocarbon emissions would be a step forward in promoting cleaner-burning vehicles while protecting air quality from degradation.

We recommend that the nonmethane hydrocarbon standard in S. 1630 replace, over time, the total hydrocarbon standard.

The Need for Anti-tampering Exemption for Alternative Fuel Vehicles

In their current form, the enforcement provisions of S. 1630 that pertain to anti-tampering sanctions would severely hamper the alternative fuel vehicle conversion industry. The anti-tampering language of the bill would preclude conversion of a vehicle from gasoline to natural gas or

propane, which are the most immediately available techniques for achieving short-term emission reductions of carbon monoxide, reactive hydrocarbons, nitrogen oxides, and particulates. This is because converted vehicles sometimes, but not always, have emissions of nonreactive hydrocarbons that exceed emission standards for hydrocarbons, even though such nonreactive hydrocarbons do not contribute to ozone formation.

The conversion industry is currently producing vehicles capable of using clean burning alternative fuels and providing emission benefits greater than achievable by current emission control devices. The conversion of conventional fuel vehicles to a clean burning alternative fuel is the quickest and easiest way to provide environmental benefits of alternative fuels today. Converting conventional fuel vehicles also ensures the development of an alternative fuel infrastructure while the states and EPA develop standards and put implementation plans in place. We recommend that vehicles converted to an alternative fuel be exempted from the anti-tampering sanctions, provided that such vehicles meet performance standards to be established by EPA.

The Need for On-Board Diagnostic Computer Compatibility with Low-Polluting Fuels

As written, S. 1630 does not take into account the

unique requirements of low-polluting fuels such as natural gas in its on-board emissions diagnostic computer requirement. These on-board computer systems need to be compatible with low-polluting fuels or the bill will have the unfortunate effect of discouraging conversions to low-polluting fuels. S. 1630 should be amended to require computer compatibility with low-polluting fuels by inhibiting self-diagnostic and adaptive warning features that would be intolerant of or inappropriate for low-polluting fuels.

The Need for a Deliberative Approach on the Issue of Global Warming

S. 1630 would require that, beginning in 1995, emissions of carbon dioxide be controlled. The bill's requirements would be roughly equivalent to fuel economy standards of 35 miles per gallon in 1995, rising to 50 miles per gallon in 2002. While these requirements are ostensibly designed to curb emissions of so-called "greenhouse gases" that are thought to contribute to warming of the earth's climate (*i.e.*, "global warming"), there are a number of measures pending before both Houses of Congress that are either more comprehensive in scope or would fund substantial research in terms of the atmospheric chemistry involved in the "greenhouse effect." Thus, we believe it would be ill-advised to take a piecemeal approach to this very complex

issue by adopting requirements that address carbon dioxide emissions. Consequently, this provisions should be deleted from S. 1630.

The foregoing discussion focuses on what we see as the major shortcomings in S. 1630 and, in some cases, how these flaws can be ameliorated. We cannot stress too strongly, however, that without an alternative fuels program, S. 1630 is to us incomplete at best.

AIR QUALITY BENEFITS OF NATURAL GAS VEHICLES (NGVs)

EPA Estimates of Emission Reductions From NGVs

On January 28, 1988, the Environmental Protection Agency issued a Technical Guidance Document, suitable for use by state and local governments in estimating the actual impact of various air quality improvement options. The document, entitled Technical Report: Guidance on Estimating Motor Vehicle Emissions From the Use of Alternative Fuels and Fuel Blends, estimates that NGVs can yield the following emission reductions:

A 50% reduction in tailpipe emissions of carbon monoxide

A 50% reduction in tailpipe emissions of reactive hydrocarbons

A 100% reduction in emissions of reactive hydrocarbons from filling stations and evaporation

We note that EPA views its estimates as advisory rather than mandatory. That is, EPA permits states and localities

to use their own estimates, in place of EPA estimates, where states and localities can show it is reasonable to do so. This point is particularly important because, in the gas industry's view, EPA has been conservative in estimating the achievable emission reductions from shifts to NGVs.

Estimates of Emission Reductions from NGVs

A.G.A. and the NGV Coalition regard EPA's estimates as conservative. Our estimates, based on gas industry experience, show that even more dramatic reductions are achievable for carbon monoxide and reactive hydrocarbons. As compared to gasoline vehicles, natural gas vehicles offer major reductions in emissions of carbon monoxide and reactive hydrocarbons.

So far, nearly all natural gas vehicles on the road are conversions of existing vehicles that once relied solely on gasoline or diesel fuel. Our experience with such vehicles indicates that, when proper procedures are used to convert older gasoline or diesel fuel vehicles to natural gas, such conversions can reduce emissions of carbon monoxide and reactive hydrocarbons by more than 80 percent.

The actual emission reductions achieved depend on a large number of factors, including the tuning of both engines, the age and design of both vehicles and the condition and technology of the gasoline emission controls

and the natural gas conversion equipment. Despite these possible variations, however, the emission reductions will be significant so long as proper procedures and equipment are employed.

Even compared to vehicles that employ new gasoline technology, NGVs can achieve significant reductions of emissions. We estimate that carbon monoxide could be reduced by up to 82 percent and reactive hydrocarbons could be reduced by up to 87 percent even in the case of new vehicles that have suffered no degradation from exposure to road conditions.

Because new gasoline vehicles have made substantial headway in reducing gasoline-related nitrogen oxide, outperforming gasoline vehicles with respect to this pollutant is a difficult challenge. However, it appears that newly manufactured engines that are designed from the start for natural gas, whether this involves "dedicated use of natural gas" or "dual capability", can be engineered to prevent any nitrogen oxide problem before it begins.

In a study recently prepared for A.G.A.,^{*/} Professor E. J. Durbin of Princeton University concludes that an engine designed to run on natural gas could achieve reductions of nitrogen oxides by virtue of the leaner air/fuel mixtures

^{*/} Durbin, E.J., Understanding Emissions Levels from Vehicle Engines Fueled with Gaseous Fuels; Princeton, N.J.; Princeton University, February 1989.

that would be possible with such an engine. These emissions reductions could be achieved without the use of a catalytic convertor, thereby maintaining low emission levels that could not be maintained over time by a catalytic convertor. The efficiency of a catalytic convertor decreases rapidly with time as the catalyst becomes poisoned with exhaust products.

A list of Professor Durbin's conclusions on fueling vehicles with natural gas is as follows:

1. This study has shown that from both emissions and efficiency points of view, gaseous fuels, and in particular natural gas fuels, are superior to gasoline in vehicular applications. The engine designer would prefer natural gas as a fuel over any other fuel.
2. Principal advantages of natural gas fuels come from the ability to create homogeneous mixtures of air and fuel more readily, which permits the use of lean combustible mixtures, and from the low carbon hydrogen ratio of fuel molecules.
3. Most assessments of emissions with natural gas fuels are based on fuel systems that have not been optimized for natural gas. These systems do not exploit the full advantages of natural gas fuels.
4. In an engine "designed for natural gas" it should be possible to achieve oxides of nitrogen emissions much lower than those emissions from gasoline engines.
5. These low emissions should be attainable without catalytic convertors to clean up the engine exhaust.
6. Total hydrocarbons can be reduced 33 to 50 percent when using gaseous fuels. When the gaseous fuel is natural gas, environmentally active hydrocarbons can be reduced 90 percent as compared with gasoline.
7. With lean mixture control systems, carbon monoxide can be effectively eliminated from the exhaust of natural gas fueled engines.

8. Carbon dioxide emissions are reduced approximately one third as compared with gasoline.

9. An essential element in achieving these results, with good driveability, is a control system which adjusts air/fuel ratio to fit power requirements. Such a control system, coincidentally, provides increased fuel economy.

Of course, while newly manufactured NGVs can be expected to outperform retrofitted NGVs in emission levels and other respects, retrofitted NGVs are still the key to any immediate improvement in pollution from carbon monoxide and reactive hydrocarbons. NGV retrofitting is the only way that we can put large numbers of alternative-fuel vehicles on the road within the next few years.

After this discussion, it may be useful to summarize our emission reduction estimates in capsule form. Table I summarizes the emission reduction estimates for retrofitted vehicles.

TABLE I

A.G.A. ESTIMATES OF ACHIEVABLE

EMISSION REDUCTIONS PER VEHICLE

WHEN GASOLINE VEHICLES ARE RETROFITTED TO NATURAL GAS *

<u>Pollutant</u>	Vehicles Using Older Gasoline Technology	Vehicles Using NEW Gasoline Technology
CARBON MONOXIDE	-99%	-82%
<u>REACTIVE</u> HYDROCARBONS	-92%	-87%

* Assumes use of proper procedures and equipment.

Use of Natural Gas in Heavy Duty Engines

Newly manufactured heavy duty trucks and buses must soon meet tightened EPA standards for heavy duty engines. Newly manufactured natural gas engines are an extremely attractive compliance option.

In 1988, newly manufactured natural gas buses, leased to the City of New York by Brooklyn Union Gas Company, were tested by EPA at the EPA facilities in Ann Arbor, Michigan. The results of these tests show that emissions from the buses met, or far surpassed, the EPA standards for model year 1991 gasoline-fueled heavy-duty engines.

For carbon monoxide, emissions were 10.6 grams per brake horsepower-hour (g/b-hp/hr), compared to a standard of 14.4.

For nitrogen oxide, emissions were 1.4 g/b-hp/hr, compared to a standard of 5.0.

For reactive hydrocarbons, which were only about 15% of the total hydrocarbons emitted, the bus emissions were extremely low. Even for total hydrocarbons, most of which do not appear to react chemically in the low atmosphere, the bus emissions were 1.2 g/b-hp/hr. The standard is 1.3.

Greenhouse Effect Considerations

Given the rising interest in possible global warming consequences from an apparent greenhouse effect, any environmental policies should take into account the

estimated direct and indirect carbon dioxide emissions from vehicular combustion of natural gas, gasoline, gas-derived methanol, coal-derived methanol and other fuels.

Carbon dioxide is thought to be the leading actor in the greenhouse effect. With this concern in mind, we bring to your attention a recent Congressional Research Service Report for Congress entitled Carbon Dioxide Emissions From Methanol As A Vehicular Fuel. This Congressional Research Service report provides somewhat different numbers from those provided in an earlier World Resources Institute study. However, both studies agree on two key points: (1) use of coal-derived methanol in vehicles will substantially increase carbon dioxide emissions; and (2) direct combustion of natural gas in vehicles will substantially decrease such emissions.

The report estimates that, in comparison to gasoline, direct combustion of natural gas in vehicles will reduce carbon dioxide emissions by 30% or more.

Natural gas vehicles do emit some unburned methane. In fact, unburned methane accounts for most of the non-reactive hydrocarbons emitted by NGVs. As the term "non-reactive hydrocarbon" suggests, unburned methane is not a chemically interactive gas and does not contribute to smog formation. We are aware of speculation that unburned methane from natural gas vehicle tailpipes, while not chemically reactive in the lower atmosphere, may nevertheless pose environmental

problems in the upper atmosphere because methane is a "greenhouse gas". The Congressional Research Service has concluded that methane emissions from NGVs would be so miniscule that, even if every vehicle in the world were to run on natural gas, the total additional emissions of methane would add only about 0.1% to the current methane emissions from all sources.* In fact, we believe, given our research on the issue, that NGVs reduce total vehicular greenhouse impacts by at least 25 percent even when considering methane emissions.

State Actions

In recognition of the air quality improvements that NGVs or other alternative fuel vehicles can make, states such as Texas, Arizona, and California have adopted measures to promote these vehicles. The most recent example of ambitious state action in this regard occurred in Texas, where the state legislature passed a bill on May 29, 1989 to promote NGVs and other clean vehicles.

The Texas legislation requires phased-in vehicle conversions to NGVs or other clean vehicles starting in 1991. State-owned or operated fleets with more than 15 vehicles, school districts with more than 50 buses, and

*Gushee, David E., "Alternative Fuels for Motor Vehicles, Some Environmental Issues," (Washington, D.C.: Congressional Research Service, 1988), pp. 17-18.

local transit authorities must convert their fleets to NGVs starting in 1991 and finishing in 1998. The legislation anticipates private financing for the vehicle conversions but allows for waivers in instances where reasonable financing is unavailable.

ECONOMIC BENEFITS OF NGVs

In addition to the obvious environmental benefits of natural gas, it may also be the most economical of all alternative fuels currently available. The cost of fueling a vehicle with natural gas is currently estimated to be about 30% - 60% of the cost of fueling a vehicle with gasoline, including the additional cost of compressing the natural gas. The price per gallon equivalent of natural gas currently ranges from 40 to 75 cents. While the pump price of natural gas varies from region to region, much like gasoline, the typical sale price of natural gas averages approximately 62 cents per equivalent gallon. Furthermore, it should be pointed out that several gas companies, including A.G.A. member Pacific Gas and Electric Company, are developing a low pressure natural gas storage system that will significantly lower the overall cost of natural gas as a vehicle fuel by obviating the need for compression.

In addition to natural gas' lower pump price, and because of its clean burning qualities, natural gas offers significant savings in vehicle maintenance costs.

Practical, on-road experience with natural gas vehicles shows that standard maintenance is half that of gasoline powered vehicles. Many users report that oil changes need not occur more than every 10-20,000 miles, and spark plugs, points and other components have lasted up to 75,000 miles in some vehicles.

SAFETY

Unlike many other alternative fuels currently under development, natural gas has a long and rich history as a vehicle fuel dating back to the infancy of the automobile itself. There are currently over 500,000 natural gas fueled vehicles worldwide, including over 30,000 in the United States. The lesson we have learned from this long history and extensive use is that natural gas may be the safest vehicle fuel of any type currently available, including gasoline.

A recent A.G.A. survey of natural gas vehicle fleet operators revealed that in over 434.1 million miles driven by the sample fleet, injury rates per vehicle mile traveled were 84% less than the national average for injuries per vehicle mile traveled for all U.S. registered vehicles.

In addition, the unique properties of natural gas itself make it extremely safe for use as a vehicle fuel. Unlike other alternative fuels, natural gas is neither corrosive nor toxic. Natural gas is lighter than air. Therefore, in the unlikely event of a leak, natural gas will

safely dissipate into the air. Gasoline and some other liquid alternative fuels form dangerous puddles and pools on the ground in the event of a leak. Moreover, natural gas' ignition point is two times higher than that of gasoline, only igniting at a temperature of between 1200 to 1300 degrees, and only within a very narrow gas-to-oxygen mixture range of 5 to 15 percent.

Finally, the fuel tank cylinders for natural gas vehicles may be the safest and most extensively tested vehicle fuel storage system available. They are typically made of reinforced aluminum or three-quarter-inch-thick steel and have been subjected to severe abuse testing. Natural gas cylinders have successfully withstood blasting with dynamite, freezing, bonfires, and bullets, all without bursting or causing fire. None of the other alternative fuels, with the exception of, perhaps, propane, can make this claim.

NATIONAL SECURITY BENEFITS OF NGVS

America's reliance on imported oil is on the rise again. At this point, foreign sources meet more than 40% of the oil we consume every year -- and many of these foreign supplies come from OPEC countries. The need for transportation fuel plays a strategic role in our nation's inability to break free.

Since the internal combustion engine was invented, oil has held a virtual monopoly in the transportation fuels market. In every other major energy use market -- from chemicals to powerplants -- substitutes for oil are readily available and can be mobilized for use in the event of another disruption of imported oil supplies. In transportation, however, oil still reigns supreme.

To grasp the extent and implications of this oil dominance, consider the fact that transportation absorbs two-thirds of all the oil we use in America. If tomorrow we stopped using oil for everything else -- for heating homes, for making chemicals, for generating power -- we would still have to import oil just to feed our transportation sector.

Clearly, America will not be able to end its vulnerability to imported oil disruptions until America introduces competition in the transportation fuel market.

Natural gas also has the benefit of a delivery system of over one million miles of existing pipeline. Through this pipeline network, natural gas can be brought to virtually any part of the nation for vehicular transportation.

AVAILABILITY OF NGV TECHNOLOGY

There may be some concern about the availability or reliability of current natural gas vehicle technology. As

previously stated, there is a long and rich history of the use of natural gas as a vehicular fuel. Of the 500,000 natural gas vehicles operating worldwide, Italy has almost 300,000 such vehicles on the road today. Other countries, such as Canada, New Zealand, and China, have extensive experience with natural gas as a vehicle fuel and large operating fleets of such vehicles. The Soviet Union has recently announced its plan to convert one million of its vehicles to clean-burning natural gas. In the U.S., we currently have approximately 30,000 natural gas vehicles on the road and operating. These vehicles range from heavy duty buses, trucks, and delivery vans to personal family cars. While there is a high degree of reliability and safety associated with natural gas vehicle technology, the natural gas vehicle industry is continuing to develop and improve its equipment.

For example, the Ford Motor Company built 27 Ford Ranger pickup trucks which were designed and built from the ground up to run on natural gas. GSM Taxi is currently producing a line of long-life vehicles suitable for use as taxis or work vans that are designed to run exclusively on natural gas. A.G.A. and NGV Coalition member Brooklyn Union Gas has already purchased 12 of these vehicles for use as service vans in its fleet. Brooklyn Union is presently testing them on the streets of Brooklyn to assess their

potential for use in the New York City market as service vans or as long-life taxis, something that New York, and many other cities for that matter, could desperately use.

For general vehicle use, there is currently a highly developed state of the art engine technology for light duty applications on vehicles weighing less than 8,000 pounds. Conversion kits are the most common applications for both carbureted and fuel injection engines. The various kits now on the market allow the conversion of existing engines either to run exclusively on natural gas or to be dual fuel capable, which allows the driver to run on either natural gas or gasoline.

The conversion kits for carbureted engines can be installed on any gasoline engine currently on the market. Conversion kits for fuel injected engines are also available. In fact, because of the more efficient mixing of fuel and air, fuel injection conversions are preferable.

There is also an extensive amount of work being performed in the design and development of engines dedicated to run exclusively on natural gas. Ford and GSM both have installed dedicated natural gas engines in their natural gas vehicles.

There is also an extensive amount of work being performed in the development of heavy duty engine technology for vehicles weighing more than 8,000 pounds. Retrofit kits

for diesel engines are available that allow diesel engines to run on a mixture of approximately 80% diesel and 20% natural gas. This mixture virtually eliminates the heavy particulate emissions produced by heavy duty diesel engines, as well as substantially reducing other harmful emissions. Southwest Gas Corporation has assisted the City of Phoenix, Arizona in retrofitting one of its transit buses with such a kit, and that bus is currently in operation in that city.

Diesel engines dedicated to running exclusively on natural gas are also currently under development. We believe that such dedicated diesel engines will be the accepted standard for heavy duty engines in the near future as they will allow heavy duty diesel engines to meet the EPA's upcoming diesel emission standards. The Gas Research Institute has allocated a total of \$11 million through 1992 to developing this and other natural gas vehicle technology. Cummins Engine Company has joined forces with the Gas Research Institute to develop a low emission heavy duty natural gas engine and has delivered the first of these engines. Also, Hercules Engine has announced its plan to deliver a dedicated natural gas diesel engine to market this year. Southwest Research Institute is developing a conversion kit which will allow existing diesel engines to be converted to run on natural gas.

The successful potential of heavy duty natural gas engine technology is being tested in Los Angeles. The Los Angeles Transportation Commission has a program that will involve the purchase of ten transit buses dedicated to running exclusively on natural gas. The program also involves the conversion of two diesel buses to run on a mixture of diesel and natural gas. Southwest Research Institute is performing the conversion with funding from Southern California Gas Company.

Brooklyn Union is currently testing two natural gas buses in daily service in New York City. The buses were manufactured by Bus Industries of America using GM 454 engines that were converted to run exclusively on natural gas. As noted previously, the buses have been through extensive emission testing by the EPA at its testing lab in Ann Arbor, Michigan and have achieved excellent results. Furthermore, last summer, Brooklyn Union drove one of its natural gas buses from New York City to the World Gas Conference in Washington, D.C. and back without any difficulty or problems. That trip was roughly the equivalent of a one-way drive from Los Angeles to San Francisco. In his address to the Conference, President Reagan praised Brooklyn Union's efforts in developing a clean-burning natural gas-fueled bus for use in New York City.

GAS SUPPLY AVAILABILITY FOR NGVS

There are clear environmental reasons to expand vehicular use of natural gas. There are no supply-related reasons to hold back.

We acknowledge that there may be infrequent, localized difficulties with gas deliverability. However, any such difficulties should be easily remedied because they are the result of either regulatory practices or operational logistics. So long as the domestic natural gas resource base remains free of price controls and other artificial market constraints, the domestic resource base -- particularly when it is coupled with supplemental North American gas sources in Canada and Mexico -- is large enough to meet substantially higher levels of gas demand. The resource base is also large enough to overcome the results of occasional marketplace misjudgments.

Recent Estimates of the Natural Gas Resource Base

A.G.A. does not stand alone in pointing to a large domestic natural gas resource base. The same conclusion has been reached by the Department of Energy (DOE).

In March of 1987, in a volume entitled Energy Security: A Report to the President of the United States, DOE told

President Reagan:

If unconventional gas supplies (such as gas shales, tight gas sands, and gas hydrates) are included in the total, the Nation's supplies of natural gas may support 200 years of consumption at current rates.

In May of 1988, DOE issued a landmark study on natural gas supplies, entitled An Assessment of the Natural Gas Resource Base of the United States. In this study, which drew upon the knowledge of a number of expert panelists, DOE focused solely on natural gas resources that are domestically available and can be recovered with today's technology. The study found that, in the lower 48 states alone, natural gas reserves and resources total 1,059 trillion cubic feet (Tcf). At the 1987 level of nationwide gas consumption, this amount is equivalent to a 62-year supply.

Of this 62-year supply of technologically recoverable gas, the equivalent of a 35-year supply is available at wellhead prices below \$3.00 per million Btus (MMBtu). This wellhead price range is not too different from prices that now occur at the peak of the winter heating season.

DOE adds that the 35-year supply can rise to a 45-year supply if wellhead prices rise to \$5.00 per MMBtu. This range is far above today's prices, but still within the historical experience of gas consumers in the early 1980s. These supply figures do not include vast natural gas resources in Alaska (estimated by DOE at 129 Tcf), Canada

and Mexico.

In short, DOE's estimates of the gas that is ultimately available to American consumers can be considered conservative. We add that DOE's resource base estimates are similar to the most recent estimates made by the Potential Gas Committee (PGC), a body of independent experts from throughout the natural gas industry. According to the latest PGC study, in the lower 48 states alone, conventionally recoverable gas at year-end 1988 (including "proven" reserves, which are already known to exist) was 832 Tcf. At 1987 gas consumption rates of roughly 17 Tcf per year, the PGC estimate is equivalent to a 49-year supply. Using either the DOE or the PGC supply estimates, it is clear that the lower 48 states are able to produce enough natural gas to meet expanded gas demand.

An "Elastic" Resource Base

In a December 16, 1988 letter that invited A.G.A. to testify at the field hearings of the Health and Environment Subcommittee of the House Energy and Commerce Committee, Chairman Henry Waxman (D-CA) asked A.G.A. this question:

In the context of both methanol and compressed natural gas, how much of the existing motor vehicle fleet in California and nationally could be powered for how long by currently known natural gas supplies?

This question highlighted the fact that the domestic supply of natural gas is an elastic resource base. A.G.A.

responded to the question by pointing out that, for a given number of vehicles, the volumes of natural gas required to fuel the vehicles indirectly -- through conversion of the natural gas to methanol -- will be more than 50 percent greater than the volumes required to fuel the vehicles directly. This is because more than one-third of the original energy content of natural gas is typically lost during the gas-to-methanol conversion process.

Beyond this response, it is important to note that a fixed natural gas inventory does not, in fact, exist. What exists instead is an "elastic" resource base: one that expands in response to the marketplace incentives of price level and demand level.

The lesson of an "elastic" resource base has become clear to the gas industry over the last 20 years. During the 1970s, prior to the enactment of the Natural Gas Policy Act of 1978, reserve replacements as a percentage of domestic production averaged 46 percent. During the 1980-88 period the reserve replacement ratio has averaged 89 percent.

During the late 1970s and early 1980s, surging wellhead prices brought forth pioneering development of frontier gas resources -- including deep gas, tight sands gas and gas from deep waters offshore. Some frontier gas volumes became accessible as a direct result of the higher wellhead prices,

while other volumes became accessible as a result of new technology induced by the higher wellhead prices. In any case, America's gas "inventory" was shown to be fluid instead of fixed.

In a variation on this theme, the subsequent drop in wellhead prices also expanded the scope of potentially accessible resources. Just as higher wellhead prices developed technology and expertise for reaching deep onshore and deep offshore gas, so lower wellhead prices induced more efficient drilling practices and development of lower-cost technology for tapping more gas from conventional onshore reservoirs. Once again, the resource base was shown to be "elastic".

Thus, we cannot say "how long" the nation's gas supplies will "last" if natural gas serves as a transportation fuel on a major scale. We can report, with recent history as our guide, that the domestic resource base will tend to grow as the nation's need to rely on it grows.

An Important New Study of Future Gas Supply and Demand

A November 1988 report, prepared by two former high-ranking DOE officials, concludes that the nation could increase its natural gas consumption by a substantial amount without triggering any disruptive distortions of the energy marketplace.

The study in question, issued by Washington Policy and Analysis, is entitled Natural Gas: A Strategic Resource For the Future. The two authors are William Martin and Scott Campbell, both of whom served as high-level DOE officials in the Reagan Administration.

One major focus of the study is possible change in overall gas supply and demand between 1987 and 2010.

Among other findings, the study concludes that, under an appropriate mix of low-cost public policy initiatives that are consciously designed to foster the increased use of natural gas, nationwide gas consumption could rise from the 1987 level of 17.1 Tcf to a new level of 24.1 Tcf in 2010. The study indicates that this major increase could occur without causing significant marketplace distortions, and the study explicitly addresses the question of how the necessary gas supplies can be obtained.

Apart from its substantive findings, the study is also historically significant for its methodology. The study is likely to represent a milestone in energy modeling because it provides the first independent analysis of the implications resulting from end-use technology developments and recent work in the area of gas resource base estimates.

POSSIBLE IMPACT OF NGVS ON OVERALL GAS DEMAND

We have attempted to develop, for purposes of gaining

perspective on domestic energy security, some estimate of how large-scale use of NGVs might affect gas demand.

Our analytical task has been complicated by the fact that America has placed on the road a great mix of vehicles, with a great diversity in fuel consumption patterns that reflects differences in engine type as well as major jumps in energy efficiency as we move from one "vehicle vintage" to another.

Table II indicates the diverse range of possible gas demand per vehicle, just among light duty vehicles.

Table II
ESTIMATED NATURAL GAS DEMAND PER VEHICLE PER YEAR*
In thousands of cubic feet (Mcf)

<u>Type of Vehicle</u>	<u>Estimated Annual Gas Demand*</u>
Old "Vintage" Passenger Car	100
Brand New Passenger Car	50
Average for All Passenger Cars, Old and New, On the Road in 1985	64**
Average for ALL LIGHT DUTY VEHICLES, Old and New, Including Light Duty Trucks, On the Road in 1985	76**

* Assumes exclusive use of natural gas.

** Derived from Department of Transportation data.

We estimate that if eight to ten million vehicles in the United States were converted to natural gas, they would only use approximately one trillion cubic feet of gas, or

roughly six percent of our total annual consumption.

Since newly acquired buses must soon meet EPA's 1991 emission standards for heavy duty engines, the Committee may be interested in an estimate of fuel consumption by natural gas buses. Although we do not have these data for municipal buses, we can use data held by the Department of Energy concerning fuel consumption by commercial buses in general, including intercity buses. Using these data as a starting point, we can offer a "ballpark" estimate that the average municipal bus, if using natural gas exclusively, would consume 860 Mcf per year.

While this consumption per vehicle is relatively high, the number of buses in America is relatively small. Almost 20,000 natural gas buses that use only natural gas would have to be placed in service before the increment of added gas consumption would reach one-tenth of 1% of the national gas consumption in 1987.

The DOE study referenced previously, Natural Gas: A Strategic Resource for the Future, provides a national perspective on possible gas demand for NGVs. The study speculates that, with low-cost but supportive public policies and vigorous efforts by the gas industry, natural gas could attain the following market shares by 2010:

-5% of the mass market for passenger vehicles

-25% of the market for public and private fleet vehicles (excluding military vehicles)

-75% of the market for commercial buses

These are reasonably ambitious market penetration goals for the natural gas industry. Yet the study concludes that, even if these goals were reached, gas demand for NGVs would be 1.7 Tcf per year, a very manageable amount of gas.

This is roughly 10% of the actual nationwide gas consumption in 1987.

COMPETITION BETWEEN NATURAL GAS AND OTHER ALTERNATIVE FUELS Need for a Balanced Transportation Fuel Mix

We know the alternative transportation fuels market is not limited to natural gas and propane. Methanol, ethanol and electricity are also seeking shares of this market. Other energy sources, such as hydrogen, may enter this market in the future.

The gas industry would exclude no energy source from this market. We strongly favor a federal policy that would permit all energy sources to compete on their own merits, restrained only by the needs of the customers and the public policy requirement that all of the competitors must meet acceptable standards for improving air quality.

Just as we would exclude no energy source from performance-oriented competition, so we would object

vigorously and vocally to any effort to exclude natural gas from competing on its merits in this market.

Strong Points of Natural Gas

The natural gas industry is confident that its product will ultimately be a popular choice in the alternative transportation fuels market. There are strong reasons for this confidence.

First, for a wide range of pollutants, gas is the cleanest-burning transportation fuel. This fact carries great weight at a time when several dozen urban areas have failed to meet the Clean Air Act deadline for attaining ozone and carbon monoxide standards.

Second, as we noted earlier, gas supplies come mostly from the United States and almost exclusively from North America.

Third, as we have also noted earlier, natural gas has the advantage of high energy efficiency. This is a major reason for our clean-burning characteristics -- and for the low operating costs of our vehicles.

Fourth, while there are obviously many compressors and refueling stations to build, the gas industry already has in place a million-mile delivery system that brings natural gas to nearly every street corner in America.

Fifth, while newly manufactured vehicles would be most welcome, to put it mildly, the gas industry does not have to wait for Detroit since existing gasoline vehicles can be retrofitted to natural gas immediately.

HOW FEDERAL PUBLIC POLICY CAN HELP

Fleet Vehicle Use of Alternative Fuels

Meeting ozone and CO non-attainment standards can be accomplished via a flexible performance based approach for vehicles. Among the legislative approaches pending before Congress, such a flexible approach might require that by a specified date, a certain number or percentage of new vehicles in non-attainment areas must be clean vehicles and that the performance standard would require these vehicles to be 50% less polluting than EPA new car standards* (for the pollutant that causes an area to be in non-attainment).

A performance standard approach promotes flexible implementation by: 1) allowing localities to choose the fuel/technology which best meets their atmospheric condition; 2) promoting technological innovation to meet the standards in a more efficient and economic fashion; and, 3) providing incentives to all engine manufacturers and to all fuels, including gasoline if technology advances.

* The 50% figure is only a suggestion and another percentage may be more appropriate.

NGVs generally can outperform gasoline on operating costs but are impeded by capital costs that typically range from \$1,000 to \$2,000 for a retrofitted gasoline vehicle. For NGVs, and for all other alternative-fuel vehicles, to achieve significant market penetration, a performance based approach must be adopted.

Public and private fleet vehicles provide a manageable scope for the initiation of expanded use of clean vehicles. Our focus in the ongoing Congressional clean air debate is to support meaningful federal legislation for the development of clean vehicles. Toward this end, we regard the Alternative Motor Fuels Act of 1988 as an important milestone. The authorization of funds for federal acquisition of alternatively-fueled passenger vehicles and light-duty trucks may provide the impetus for a network of refueling stations to be developed. The lack of nationwide refueling stations presents a significant barrier to expanded use of alternative-fuel vehicles.

Contemporary proposals that would also expand alternative-fuel vehicle use include S. 1058, introduced by Senator Jeff Bingaman (D-NM), and its House counterpart, H.R. 2175, introduced by Representative Vic Fazio (D-CA). These bills would require federal fleets in serious or severe health endangerment areas for ozone or carbon monoxide to become alternatively-fueled by increasing

increments of 10 percent, beginning in 1993. A.G.A. endorses these bills as measures that have great potential to break the impasse between an insufficient number of refueling stations to service additional vehicles and an insufficient number of vehicles to support a public refueling network.

Action to Establish An EPA Reactive Hydrocarbons Standard

The Environmental Protection Agency already has a total hydrocarbon standard in place to impose limits on hydrocarbon emissions. Traditionally, because NGVs were not considered numerous enough to have a significant impact on the environment, EPA has not been concerned with applying this standard to NGVs. Thus, EPA's total hydrocarbon standard has not posed a major impediment in the past.

However, as NGVs increase in number, EPA's total hydrocarbon standard could start to pose serious regulatory problems for many NGVs. Furthermore, some of the leading Congressional proposals would impose total hydrocarbon standards on all or part of the vehicle types affected. We do not believe this is necessary, since natural gas vehicles emit very low levels of reactive hydrocarbons and typically encounter no difficulty in meeting a reactive hydrocarbon standard. At the same time, however, NGVs do emit some chemically inert gases (principally unburned methane).

These chemically inactive emissions usually account for as much as 80-85% of the total hydrocarbon emissions from NGVs. For this reason, a total hydrocarbon standard, which counts even those hydrocarbons that are chemically inert, poses a major problem for many NGVs.

To date, EPA has not been receptive to our informal requests for revision of this standard. However, Congressional action on mobile sources in the context of Clean Air Act revisions could rectify this problem.

A sound environmental policy should include a directive that EPA revise its emission standard to address only reactive hydrocarbons.

Action to Adjust EPA Anti-Tampering Regulations

A similar problem is posed by standing EPA regulations that prohibit tampering with the emission control equipment on gasoline vehicles. If read narrowly, these established anti-tampering regulations can be construed to prohibit retrofitting gasoline vehicles to run on alternative fuels such as compressed natural gas, even though such retrofitting work will reduce vehicular emissions.

Like EPA's reactive hydrocarbon standard, the current anti-tampering regulations have not yet operated to impede any NGVs. However, the potential for EPA involvement is likely to rise as we see a dramatic increase in the number

of NGVs on the road. To date, EPA has not agreed to any gas industry requests for revision of, or favorable clarification of, the existing anti-tampering regulations.

There are anti-tampering provisions in all Congressional clean air bills that address mobile source emissions. We are urging Congress to include corrective language on EPA anti-tampering policies such as the language found in H.R. 99 that exempts NGV conversions from anti-tampering sections.

Adoption of Federal Tax Policies to Reduce Capital Cost Barriers to Acceptance of NGVs

Tax incentives can be very helpful in reducing the capital cost barriers to acceptance of NGVs and other alternative-fuel vehicles.

Tax policy falls outside of this Subcommittee's jurisdiction. Nevertheless, because tax incentives could fulfill an important role in environmental policy, we note that Rep. Mike Andrews (D-TX) has introduced important tax policy legislation, H.R. 2269, on this subject.

The purpose of the bill is to promote improved air quality through increased use of vehicles that use a clean-burning fuel. Toward that end, the bill would allow an "air quality" tax credit of 20 percent for business use of certain equipment. The credit is phased out beginning in the year 2000, with complete elimination of the credit by 2002.

Eligible equipment includes the following:

1. NGV conversion equipment installed in connection with a retrofit vehicle so that the vehicle is capable of running on natural gas.
2. The portion of the cost of a new, dedicated NGV that is attributable to the fuel storage, combustion, or exhaust.
3. The cost of NGV refueling stations. To promote NGV use by state and local governments, the bill would make credit-equivalent payments to these governments for the purchase of property that otherwise would give rise to the credit.

The bill applies to NGVs and to vehicles fueled by propane. It also applies to vehicles fueled by methanol or other alcohol fuels.

A.G.A. endorses H.R. 2269 as an important reduction of the capital costs associated with expanding the use of alternative-fuel vehicles.

Federal Emission Standards for all Alternative Fuels Should be Established

We commend the provision of S. 1630 that would establish emission standards for alternative fuel vehicles. However, this provision should be improved by specifying that the hydrocarbon standard to be established should apply to nonmethane hydrocarbons. Original equipment

manufacturers must have standards against which to design and manufacture equipment. The high capital cost of such equipment prohibits manufacturers from investing in trial production runs. Certainty is needed. Unfortunately, with the exception of existing gasoline emission standards and the methanol standard recently promulgated by EPA, alternative fuels are in regulatory limbo. Appropriate standards and testing procedures are needed based on the unique attributes for each fuel. In the case of natural gas, a hydrocarbon standard that differentiates between reactive and non-reactive hydrocarbons is essential.

CONCLUSION

Natural gas vehicles can make a dramatic contribution to cleaner air. We have a technology that works, and we have the gas supplies to back up that technology. There is no reason to restrain the expanded use of NGVs. There is every reason to encourage it.

We have spelled out, in some detail, specific ways in which the federal government can remove the barriers to NGVs, and create low-cost incentives for their use.

As part of a sound environmental policy, we urge this Subcommittee to adopt a balanced approach to promoting the use of alternative fuels in serving this nation's immense and growing transportation needs.

TESTIMONY OF TOM CACKETTE
DEPUTY EXECUTIVE OFFICER
CALIFORNIA AIR RESOURCES BOARD

Clean Alternative Fuels

SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
SEPTEMBER 28, 1989

Good afternoon, and thank you for giving me this opportunity to testify. California has been evaluating alternative fuels for a decade. We have demonstrated the use of clean, alternative fuels in cars, trucks, buses, tractors and power plants. We have measured the emissions from vehicles fueled by methanol, ethanol, natural gas, propane, hydrogen and electricity. Some of our demonstration vehicles have been driven over 100,000 miles.

This body of evidence, and other information provided by experts from around the world, was recently assembled and reviewed by a blue ribbon Advisory Board comprised of four members of the Governor's cabinet, three vice presidents of major oil companies, two county supervisors, and members of the alternative fuels industry, motor vehicle industry, and the public. The Advisory Board assessed the environmental benefits of clean fuels, their cost, their impact on energy security, and evaluated how their introduction into the marketplace could be initiated.

With respect to the environmental benefits of clean fuels, the Advisory Board concluded that clean fuels will provide improvements in air quality beyond what is achievable from gasoline fueled vehicles using the most advanced emission controls. It also found that it is likely these improvements will be needed if air quality standards are to be met.

Stated another way, a solution to Los Angeles' air pollution problem will have to include new, more stringent emission standards, as well as increased use of cleaner motor vehicle fuels. This conclusion has been confirmed in the recently adopted State Implementation Plan for the greater Los Angeles area. This plan identifies the need for 40 percent of new light-duty motor vehicle sales to be clean fueled by the year 2000. At the recommendation of the Advisory Board, the CARB staff is proceeding to develop the regulations necessary to

achieve this goal. The CARB will consider adoption of these regulations one year from now.

During its evaluation of alternative fuels, the Advisory Board assessed concerns that the use of alternative fuels was unwise and will create new environmental problems. In general, the Advisory Board found there were answers that address these concerns. In the remainder of my testimony, I would like to identify some of these concerns, and share with you our response which is based on detailed studies and expert testimony presented to the Advisory Board.

Air quality improvements: Critics have argued that methanol vehicles will have higher emissions than comparable gasoline vehicles, and that this will negate any potential air quality benefits. An auto industry member of the Advisory Board refuted this claim, and all evidence suggest that the exhaust of methanol vehicles is chemically more benign, thus creating less smog formation than gasoline exhaust. This was quantified in a recently completed study performed by Carnegie-Mellon University, in which it was demonstrated that methanol exhaust (M100) created only 20 percent as much smog as gasoline exhaust. In summary, the evidence weighs heavily towards a conclusion that the use of methanol, and other clean fuels, will improve air quality.

Formaldehyde emissions: Prototype methanol vehicles emit more formaldehyde emissions than gasoline cars, and thus it has been suggested that methanol use will increase exposure to formaldehyde, a suspected carcinogen. The Carnegie-Mellon study I mentioned before addressed this issue and found that ambient formaldehyde would not increase even if formaldehyde emissions from methanol vehicles were higher. This occurs because most of the outdoor formaldehyde we breathe is chemically formed in the air during smog formation. Reduce the smog, which will occur if methanol is used, and you reduce the amount of formaldehyde formed in the atmosphere. This reduction is enough to accomodate an increase in tailpipe emissions of formaldehyde. To assure that tailpipe emissions are as low as technically feasible, the CARB has adopted emission standards for methanol-fueled vehicles which will limit formaldehyde emissions to levels approaching those of gasoline vehicles. In summary, methanol use will not increase public exposure to formaldehyde. However, its use will reduce exposure to many of the cancer-causing compounds, such as benzene, which are now emitted by gasoline-fueled vehicles.

Global warming: It has been argued that the use of alternative fuels could exacerbate global warming. This concern has been especially focused on methanol made from coal. Methanol is not currently made from coal, and any expanded production of methanol in the foreseeable future will use natural gas as a feedstock. A recently published study of the global warming impact of the use of natural gas, and methanol made from natural gas, as transportation fuels shows the use of these fuels will reduce greenhouse gases by a few percent to over 20 percent. While the use of alternative fuel may not be a solution to global warming, it will not make the problem worse.

Spills: Methanol is a toxic chemical, and thus it has been suggested that spills or tank leakage could cause an environmental problem. Everyone agrees that spillage of toxic chemicals should be avoided. Fortunately, methanol is soluble in water and is quickly dispersed. Thus an accident such as the Exxon Valdez would have had minimal environmental impact if the cargo had been methanol instead of crude.

Underground leakage could create a problem until the methanol is adequately diluted in the aquifer. In California, all new underground storage tanks feature double containment to prevent leakage. However, clean-up techniques similar to those developed for gasoline spills need to be developed for methanol.

The use of other alternative fuels raises similar concerns. These concerns are being addressed by quantifying the benefits and risks of the fuels' use, and applying common sense practices to minimizing the risks.

In summary, our evaluations indicate there are no "show-stoppers" to the increased use of clean fuels. We are certain enough of this that we have begun a program to introduce clean fuels into the transportation fuel marketplace in California. We are confident the use of clean fuels will improve our air quality.

WRITTEN TESTIMONY OF ARCO CHEMICAL COMPANY
TO THE SENATE SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION

OXYGENATED FUELS AND THE CLEAN AIR ACT:

TECHNICAL AND POLICY CONSIDERATIONS

SEPTEMBER 28, 1989

1. ARCO Chemical Company Overview

ARCO Chemical Company (ACC), a Delaware corporation, is a public company with shares traded on the New York Stock Exchange. In 1988, ACC had sales of 2.7 billion dollars.

Approximately 25 percent of this revenue was from the sale of methyl tertiary butyl ether (MTBE), a gasoline blending component. MTBE is widely used throughout the world as a premium octane enhancer and more recently as an effective method for reduction of automotive emissions.

ACC is the world's largest producer of MTBE with existing capacity of over sixty-one thousand barrels a day which represents 45 percent of total worldwide capacity. ACC has been a producer and proponent of oxygenated fuels for over twenty years. Our product line has encompassed alcohols, alcohol blends and ethers. As a result of ACC's MTBE capacity, we are also the world's largest purchaser of methanol.

ACC has obtained numerous waivers from the U.S. Environmental Protection Agency (EPA) for the use of oxygenated fuels in gasoline. In addition, we have been active in working with various localities in the U.S. (Denver, Phoenix, Albuquerque, Las Vegas, Reno, Tucson) and international cities, such as Mexico City, and cities in Europe to assist local authorities to effectively utilize an oxygenated fuels program to address their particular air pollution problems.

ACC's background uniquely qualifies the company to participate in the Clean Air Act debates surrounding oxygenated fuels and automotive emissions and we welcome the opportunity to submit this testimony to the Senate Subcommittee on Environmental Protection.

2. Introduction

The improvement of air quality requires broad cooperation across all segments of society and industry. There is no one solution to this issue nor are there single industries which can unilaterally adapt control programs to achieve attainment goals. Similarly, regulatory programs or legislation designed to favor a specific group or industry in the context of clean air will also be detrimental to national attainment objectives. The complexity of the air quality issue demands a flexible program with equal and equitable consideration of all viable alternatives.

One proven tool which can play a role in the attainment of clean air goals is the use of oxygenated fuels. Oxygenated fuel components such as MTBE and ethanol, when blended into

gasoline can significantly reduce automotive carbon monoxide (CO) emissions. In addition, the ether oxygenated fuels (MTBE and ETBE) can reduce hydrocarbons (HC) and other pollutants through a combination of combustion leaning, reduced volatility and elimination or reduction of other high emission components of the gasoline.

More recently, this latter concept has been extended to include a comprehensive reformulation of gasoline which may significantly expand the emission reduction benefits achieved via oxygenated fuel gasoline blends.

One clear advantage of oxygenated fuels and reformulated gasoline is the potential to have significant near term reductions in automotive emissions. While effective implementation of such a program requires further research, particularly in regards to optimizing the design of reformulated fuels and the automotive system, the prospects for immediate progress are significantly higher than those of other alternative fuel programs under consideration (e.g., neat methanol, natural gas, propane, hydrogen, etc.).

Therefore, in the structuring of any clean air program, oxygenated fuels and reformulated gasoline should receive prominent consideration. However, the emission reduction benefits of oxygenated fuels and reformulated gasoline have limits. Also, the characteristics of specific oxygenated fuels are different. For instance, MTBE can provide significant hydrocarbon reduction benefits as well as reducing CO emissions, whereas splash-blended ethanol will only yield a CO reduction benefit. These limits and characteristics must be recognized to develop a consistent, effective regulatory program. The sections which follow explain these limits and characteristics with the intent of assisting Congressional efforts to effectively amend the Clean Air Act.

3. Specific Characteristics of Various Oxygenated Fuels

All oxygenated fuels are not the same; among other things, they differ in terms of: vapor pressure, emission reduction potential, oxygen content, cost, etc. Figure 1 summarizes the key characteristics and relevant technical data for the primary oxygenated fuels. While all oxygenated fuels provide CO emission reductions, some are more effective than others and there are related factors which must be weighed in developing a balanced oxygenated fuels program.

For instance, as seen on Figure 1, the alcohols contain more oxygen than the ethers. Therefore, they are more effective in adding oxygen to gasoline when that is the only goal. However, the alcohols are considerably more volatile than the ethers as measured by the blending Reid

vapor pressure (BRVP). To help minimize the unfavorable economics associated with the alcohol's higher volatility, the alcohol waivers requested and received approval to blend at the highest acceptable oxygen level. Gasoline blending economics for ethers do not require such a high volume level, therefore waivers for higher oxygen limits were never requested for the ethers.

4. Relation between Oxygenated Fuel Level and Tailpipe Emission Reductions

An important consideration in structuring an oxygenated fuel-based emission control program is the relative and absolute reduction achieved per volume of oxygenated fuel added to the base gasoline. The relationship between oxygen (O₂) content and tailpipe emission reduction is shown in Figure 2. As can be seen from these data, by far, the greatest impact in both CO and hydrocarbon reductions is achieved with the first 2 wt% O₂. For CO, a 2 wt% O₂ fuel provides approximately 80% of the reduction of that from a 3.5 wt% O₂ fuel. For unburned hydrocarbons (UBHC), the reduction flattens out after 1.5 wt% such that UBHC reductions with 2 and 3.5 wt% O₂ in the fuel are the same.

Further reductions in UBHC's can be realized when the oxygenated fuel is blended at the refinery (versus splashed blended in the marketplace as is typical of ethanol blends). The oxygenates generally provide sufficient octane to enable the refiner to reduce aromatics in gasoline by at least half as much as the oxygenated volume added. This provides an additional reduction in UBHC as illustrated in Figure 2. This additional ozone reducing benefit is not realized when the oxygenate is added (splashed on) in the marketplace such as is done for gasohol. Due to the water susceptibility of the lighter alcohol blends, oxygenate blending at the refinery is usually limited to the ethers (MTBE, ETBE, and TAME) or to less water susceptible alcohols such as GTBA. Other benefits of using the oxygenates' octane to lower aromatic content is a reduction in tailpipe aromatics (toxics), and a reduction in the gasoline's carbon content (lower CO₂ production).

An effective regulatory program should focus on the cost-effectiveness of the options available. For oxygenates, a breakpoint occurs at the 2 wt% level, above which diminishing returns necessitate consideration of other options before moving to higher levels.

5. Volatility Considerations - Evaporative Emissions

As previously stated, an additional advantage provided by the ether-oxygenated fuels is their lower volatility. The differences in volatility are illustrated in Figure 3 where the vapor pressure change versus oxygen content is shown

for each of the common oxygenates. Under the current waivers, only the more volatile alcohol blends are allowed to exceed 2.7 wt% oxygen in the fuel. This characteristic is important in ozone non-attainment areas. The contribution of "vapor pressure" related emissions to the ozone problem is the driving force behind EPA and northeastern states regulations requiring a reduction in the Reid vapor pressure (RVP) of gasoline. The ether oxygenated fuels will enhance the successful achievement of this regulatory effort. On the other hand, the alcohol oxygenated fuels will increase gasoline volatility if not compensated for with butane removal during refinery blending. This is an important consideration where both CO and ozone are clean air problems which is the case for most non-attainment areas.

6. Reactivity - Ozone Formation

Fuel oxygenates are also less photochemically reactive than most gasoline hydrocarbons, and therefore provide additional ozone reduction by diluting more reactive constituents in evaporative emissions from gasoline. In addition to reactivity, the blending vapor pressure of the compounds are also an important consideration since a compound cannot contribute to ozone formation from evaporative emissions if it is not volatile enough to vaporize from the gasoline. Many of compounds found in gasoline are listed in Figure 4 with their reaction coefficient, blending vapor pressure and chemical class. The oxygenates are generally the least reactive compounds while the olefins are usually the most reactive with the paraffins and aromatics spread in between. Some of the most reactive olefins are also raw materials for making oxygenates. Therefore, a number of these volatile and reactive olefins can be removed from the gasoline by converting them to ethers at the refinery.

An emission reduction comparison illustrating the concepts of tailpipe emission reductions, reduced aromatics, volatility and reactivity is made in Figure 5 for two oxygenated fuel blends and a possible M85 methanol program. On a hydrocarbon reduction basis, the reduction per car is greater with the M85 than with the 2 wt% MTBE fuel. However, the overall reduction potential may be greater with the 2 wt% MTBE fuel as it can be implemented in the total car fleet quickly versus ten plus years before M85 could penetrate 30% of the total car fleet. Oxygenated fuels also require significantly less alcohol production than M85 (15% of M85), and do not require a major change to new car technology or fuel distribution systems to accomplish this reduction in emissions. The M85 also does not provide a CO reduction benefit which is the oxygenated fuels' largest emission benefit.

7. Volume/Production Considerations/Constraints

One obvious concern related to the relative oxygen level is the overall volume of oxygenated fuels available to meet requirements. For the two primary oxygenated fuels used in gasoline, ethanol and MTBE, Figure 6 shows current capacity versus required capacity at various O2 levels relative to a given percent of the overall U.S. gasoline pool that may require oxygenated fuels. Some of the suggested oxygenate programs would require 30 percent or more of U.S. gasoline to contain oxygen, and this will necessitate a substantial increase in existing oxygenated fuel capacity. The technology to produce all oxygenated fuels is widely available. Without subsidies, the most cost-effective fuel oxygenate is MTBE. The two primary feedstocks to produce MTBE, methanol and isobutylene, are large worldwide commodity materials produced from natural gas and natural gas liquids and in refinery operations. In fact, supply from refinery operations will increase substantially under EPA's new volatility standards which force removal of butanes from gasoline.

With the current government subsidy, ethanol is viable as gasohol. ETBE can also compete with MTBE in today's environment if the same federal subsidy is extended to ethanol that is used to make ETBE.

One other production issue which must be addressed is the current seasonality of oxygenate programs. If the government requires the widespread use of oxygenated fuels, thereby stimulating new plant investments in the private sector, it may be necessary to consider a year-round program to create a consistent demand. If oxygenated fuel programs are only operated during short periods of the year, the oxygenated fuel plants will not be economic nor technically sound, and the program may never have a reliable supply.

Therefore, given sufficient time for research, planning and new construction, we believe it is technically and economically feasible to implement a year-round oxygenated fuel program.

8. Reformulated Gasoline

A recent alternative fuel concept which potentially can extend or synergistically enhance the benefits of oxygenated fuels is reformulated gasoline.

Reformulated gasolines hold significant potential for reducing both the emissions and the contribution of those emissions to ambient levels of air pollutants. Reformulated gasoline should be included in any consideration of "low polluting fuels" and it should be specifically included in the definition of "low polluting fuel".

ARCO Products Company (ARCO) recently introduced an environmentally engineered gasoline called EC-1 in Southern California. "EC" stands for emission control. EC-1 is the first in a series of gasolines specifically formulated to reduce emissions from motor vehicles. ARCO's long-term plan is to convert all of its gasoline to new, emission control formulas.

EC-1 is formulated to reduce emissions from older cars and trucks that now run on leaded gasoline. To formulate EC-1, MTBE was added, aromatics and olefins were reduced by one-third, benzene was cut in half, vapor pressure (RVP) was reduced by 1 psi, sulfur was reduced by 80% and the lead was removed.

The older cars and trucks that will use EC-1 only represent about 15% of the on-road vehicle population in Southern California and travel about 10% of the total vehicle miles traveled; yet, they produce approximately 30% of the vehicular pollution. If all current users of leaded gasoline were to use a gasoline similar to EC-1, the pollution reduction would be equivalent to removing 20% of the older vehicles from the road.

This is a significant first step to demonstrate emission reduction potential of reformulated gasoline.

9. Other Issues/Benefits

Certain other issues related to the use of oxygenated fuels are worth discussing for purposes of clarity and comprehensiveness. Tailpipe emission control programs that reduce CO and unburned hydrocarbons by leaning the engine may result in some increase in NOX. Therefore, oxygenated fuels may result in a slight increase in NOX emissions, generally on the order of 1 to 5% depending to large degree on the fuel oxygen content. The higher the oxygen content, the higher the NOX increase. While hydrocarbons are generally the controlling component in ozone formation, in certain localities NOX may be a significant factor. However, recent evidence suggests that the combination of oxygenated fuels and reformulated gasoline may reduce NOX, most likely due to the effect of reduced aromatics. This effect is another important consideration when the objective is both CO and smog control.

Similar to NOX emissions, aldehyde emissions will also increase as the engine's fuel mixture becomes more lean. Therefore, any emission control program that leans out the engine combustion such as I/M programs, RVP reductions and oxygenated fuels will result in higher aldehyde emissions. It is not a phenomena limited exclusively to oxygenated fuels. As oxygenated fuels reduce unburned hydrocarbon emissions from the tailpipe, the overall percentage of aldehydes in the ultimate HC emitted will increase. While

this is a significant issue for neat fuel programs, the magnitude of the increase in the case of oxygenated fuel-gasoline blends (3 to 10%) is not nearly as large.

The environmental benefits of raising fuel oxygen content must also be balanced against potential losses in the gasoline's performance and compatibility in the automobile. If not compensated for by refinery blending, the increased volatility of alcohol blends exacerbates incidences of hot vapor locking or stalling in traffic. Likewise, the same enrichment which reduces emissions will also lead to a deterioration in cold driveability. The 3.7% oxygen limit was originally established as a tolerable level of driveability loss for most cars assuming the more sensitive cars would always have a choice of pure hydrocarbon fuel in the marketplace. This may not be an appropriate assumption if all gasolines contain a high level of oxygen. Refineries have some flexibility to compensate for the effects of oxygen on fuel driveability by adjusting mid-range volatility, but this flexibility is generally exhausted when the refiner's total gasoline pool exceeds 2 % oxygen. Lastly, the susceptibility of alcohol blends to moisture and possible phase separation of alcohol from the gasoline increases the probability for incidences of corrosion and fouling of the fuel system which can effect emissions and lead to higher maintenance cost and poorer performance.

Finally, being hydrogen saturated compounds, the oxygenates have less carbon content than the hydrocarbons found in gasoline. Fuels with low carbon content are preferable for minimizing CO₂ emissions. In addition to using the oxygenate to dilute the carbon content of gasoline, the octane from the oxygenate when blended at the refinery can be used to further reduce the gasoline's carbon content by replacing the aromatics with other hydrocarbons that contain twice as much hydrogen. Therefore, adding 2 wt% oxygen to the gasoline at the refinery can reduce the finished gasoline's carbon content by 2.5 to 3%.

10. Conclusions

The ability of oxygenated fuel blends and reformulated gasoline to reduce primary pollutant emissions is a technically sound mechanism which must be considered in any regulatory effort to reduce automotive emissions. However, this ability has technical and economic limits which must be recognized in designing an effective program. These limits suggest the following guidelines:

- 1) A national framework should be established for achieving both CO and ozone air quality improvements through a program that allows states to take into account their particular situations and the many benefits which oxygenates and reformulated gasoline can provide.
- 2) The maximum environmental potential benefit from the use of oxygenates in gasoline is achieved when they are blended at the refinery versus splash blending them on gasoline at the marketplace.
- 3) The optimum environmental benefit is achieved around 2 wt% oxygen in gasoline. The need to use higher levels of oxygen can be best determined by the individual localities that have very severe CO problems and where the hydrocarbons/ozone levels are not a significant concern.
- 4) A national program that is structured to achieve the optimum environmental benefit from oxygenated fuels will create a demand that exceeds the existing supply of oxygenates (ethanol and MTBE) by at least 200%.
- 5) A national program should provide sufficient clarity, duration and planning lead-time to enable new investments to take place efficiently.

Appendix

Figure 1 - Blending Characteristics of Fuel Oxygenates

Figure 2 - Tailpipe Emission Reduction Versus Fuel Oxygen Content

Figure 3 - RVP Effects of Adding Oxygenates to 9 RVP Fuels

Figure 4 - Reactivity and Blending Vapor Pressure

Figure 5 - Comparative Emission Reduction Benefits:
MTBE Fuel, Gasohol, M-85

Figure 6 - Oxygenated Fuel Volume Requirements for
Federal Mandate

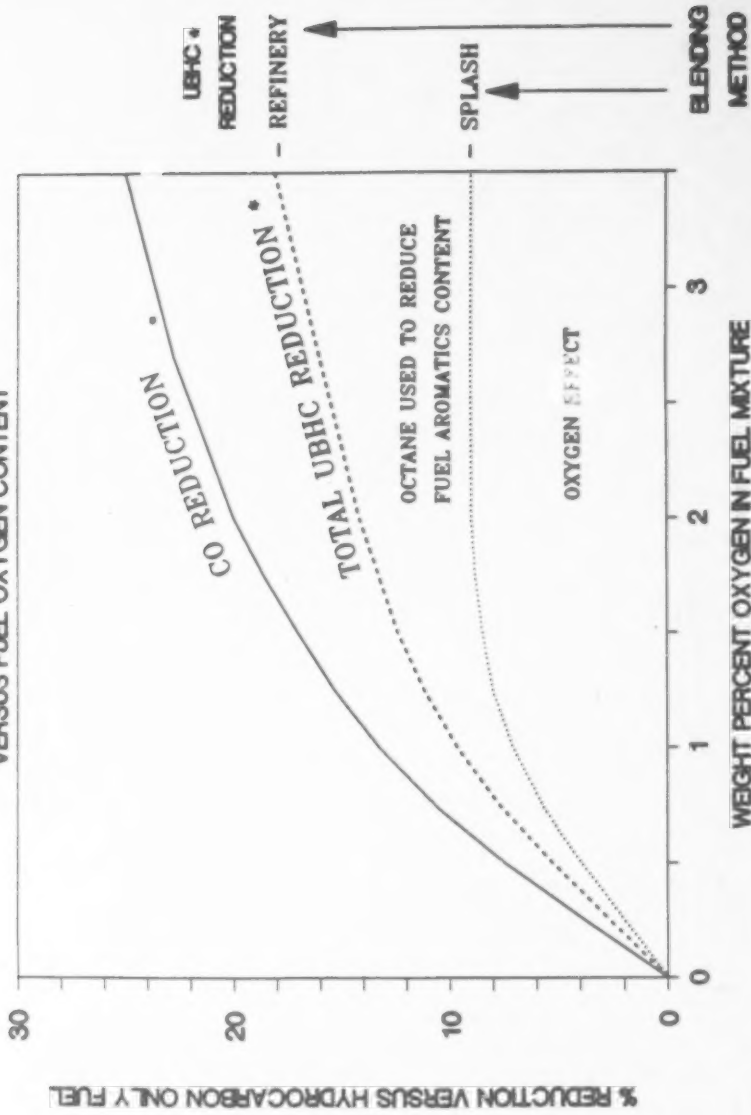
FIGURE 1

BLENDING CHARACTERISTICS
OF FUEL OXYGENATES

	BOILING POINT (F)	BLENDING RVP PSI	OCTANE R+M/2	OXYGEN CONTENT WT. %	(3) BLENDING LIMITS	
					VOL. %	WT % OX.
ALCOHOLS:						
METHANOL	148	60 ⁺	120	50	-	-
ETHANOL	173	19	115	35	10	3.7
OXINOL 50 ⁽¹⁾	145/180	31	108	35	9.5	3.5
GTBA ⁽²⁾	181	12	100	21	16	3.7
ETHERS:						
MTBE	131	8	110	18	15	2.7
ETBE	161	4	111	16	13	2.0
TAME	187	1	106	16	13	2.0

- (1) TRADEMARK FOR 50/50 MIXTURE OF METHANOL AND GTBA
 (2) GASOLINE GRADE TERT BUTYL ALCOHOL (T - BUTANOL)
 (3) LIMITS APPROVED BY U.S. EPA WAIVER

FIGURE 2
TAILPIPE EMISSION REDUCTION
VERSUS FUEL OXYGEN CONTENT



* UBHC - UNBURNED HYDROCARBONS

FIGURE 3
RVP EFFECTS OF ADDING OXYGENATES TO 8 RVP FUELS

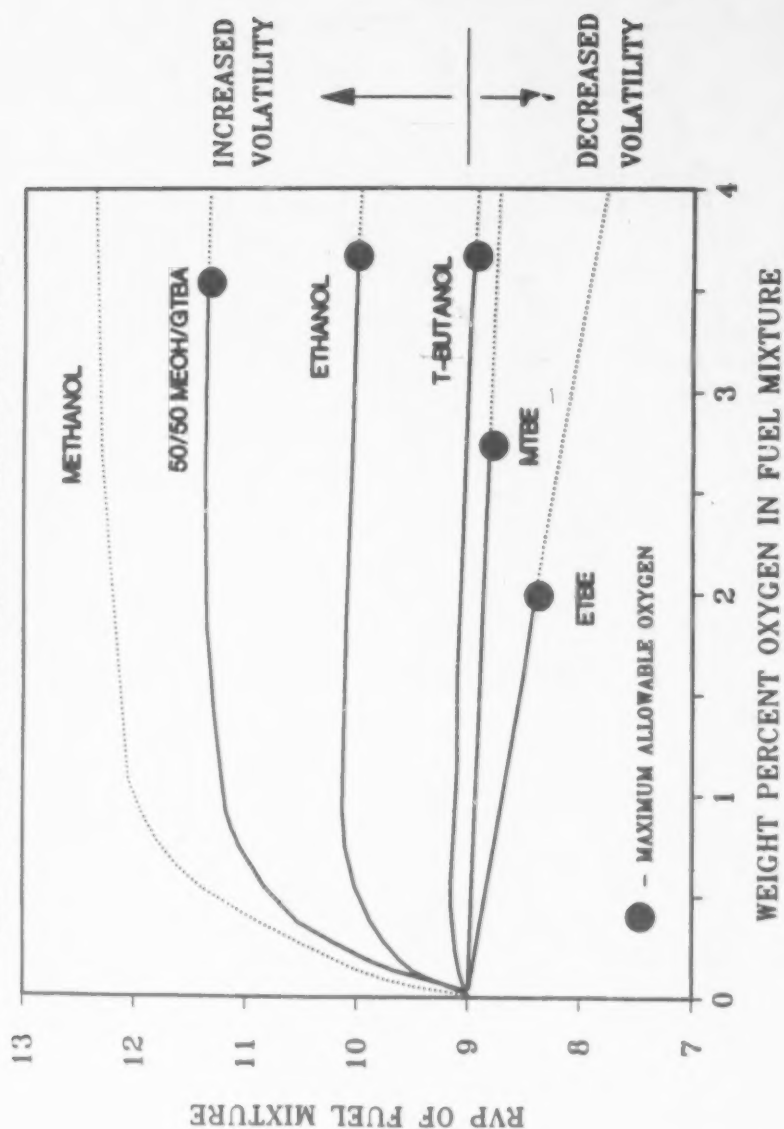


FIGURE 4

ATMOSPHERIC REACTIVITY
VOLATILE GASOLINE & TAILPIPE EMISSION COMPOUNDS

HYDROCARBON TYPE	COMPOUND NAME	ATMOSPHERIC REACTIVITY (-OH RATE)	BLENDING VAPOR PRESSURE PSI
XX	METHANOL	1.0	60.0
XX	T-BUTANOL	1.1	10.0
P	Propane	1.2	190.0
A	Benzene	1.3	3.2
P	Isobutane	2.5	75.0
XX	MTBE	2.6	8.0
P	N-butane	2.7	55.0
XX	ETHANOL	3.4	18.0
P	Isopentane	3.6	21.0
P	N-pentane	5.0	16.0
P	Isohexane	5.0	6.8
P	N-hexane	5.6	5.0
A	Toluene	6.4	1.0
P	N-heptane	7.3	1.6
O	Ethylene	8	250.0
A	P-xylene	11	0.3
XX	FORMALDEHYDE	11	60.0
O	Propylene	17	226.0
A	M-xylene	23	0.3
O	Pentene-1	30	19.5
O	Butene-1	30	65.0
O	3M1butene	32	27.0
O	Hexene-1	36	6.0
O	Isobutene (1)	55	66.0
O	Butene-2	65	49.0
O	Pentene-2	68	15.5
O	2M1butene (2)	70	19.0
O	2M2butene (2)	85	15.0

P - PARAFFINS

(1) FEED FOR MTBE OR T-BUTANOL

O - OLEFINS

(2) FEED FOR TAME

A - AROMATICS

XX- OXYGENATES

SOURCE FOR -OH RATES:

ROGER ATKINSON, CHEMICAL REV., 1985, 85, 69-201

"KINETICS AND MECHANISM OF GAS-PHASE REACTIONS OF HYDROXYL
RADICALS WITH ORGANIC COMPOUNDS UNDER ATMOSPHERIC CONDITIONS"

FIGURE 5

EMISSIONS REDUCTION BENEFITS

OXYGENATE BLENDS VERSUS METHANOL (M85) PROGRAM

	<u>OXYGENATED FUEL BLENDS</u>		<u>M85 PROGRAM</u>	
	<u>2 WT.% OXYGEN REFINERY BLENDED (1)</u>	<u>10% ETHANOL SPLASH BLENDED</u>	<u>PER CAR</u>	<u>30 % MARKET SHARE</u>
PERCENT OXYGEN IN FUEL	2 %	3.5%	42 %	-
<u>HYDROCARBON :</u>				
TAILPIPE -				
- OXYGEN EFFECT	9 %	9 %	30 %	9 %
- REDUC'D AROMATICS (2)	6 %	0 %	0 %	0 %
(REFINERY BLENDING)	----	----	----	----
TOTAL TAILPIPE	15 %	9 %	30 %	9 %
	(3)	(4)		
EVAPORATIVES -	0 - 10 %	(3 - 10 %)	30 %	9 %
NET HYDROCARBON :	10 - 13 %	0 - 3 %	30 %	9 %
<u>CARBON MONOXIDE :</u>	20 %	25 %	0 %	0 %

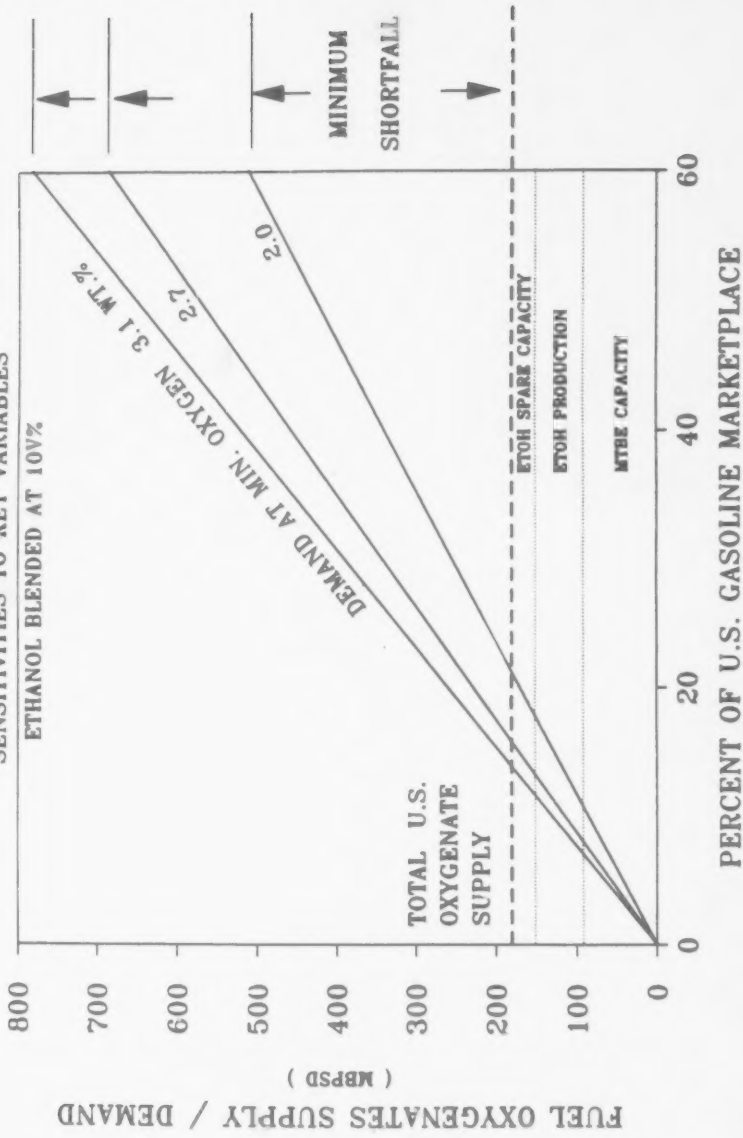
(1) 2 WT% OXYGEN : 11% MTBE, 13 % ETBE OR 10% GTBA

(2) OCTANE FROM OXYGENATES USED TO REDUCE FUEL AROMATICS

(3) EQUIVALENT REDUCTION FROM DILUTION OF REACTIVE OLEFINS

(4) DILUTION BENEFITS OFFSET BY HIGHER RVP EMISSIONS

FIGURE 6
OXYGEN REQUIREMENTS FOR FEDERAL MANDATE
SENSITIVITIES TO KEY VARIABLES



MBPSD = THOUSAND BARRELS PER STREAM DAY



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**TESTIMONY OF
 ERIC VAUGHN
 PRESIDENT & CHIEF EXECUTIVE OFFICER
 RENEWABLE FUELS ASSOCIATION**

**BEFORE THE
 SENATE COMMITTEE ON ENVIRONMENT & PUBLIC WORKS
 SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION**

**WASHINGTON, D.C.
 SEPTEMBER 28, 1989**

On behalf of the members of the Renewable Fuels Association, the national trade association for the domestic ethanol industry, I want to thank you for this opportunity to testify before the members of the Senate Subcommittee on Environmental Protection concerning S. 1630, the "Clean Air Restoration and Standards Attainment Act of 1989".

INTRODUCTION

The United States fuel ethanol industry has a current operational production capacity of over 1 billion gallons per year. More than 60 ethanol manufacturing facilities located in 22 states are operating today. Domestic ethanol producers have invested over \$2.5 billion in private sector resources to construct modern and efficient ethanol production facilities.

In 1988 alone, 850 million gallons of ethanol were produced from 340 million bushels of surplus grain. As a direct result of ethanol production, it is estimated that farm income in 1988 increased \$750 million, federal farm program costs were reduced by nearly \$600 million, and crude oil imports fell by 40 million barrels.

Fuel grade ethanol became commercially available in the U.S. in the late 1970's in response to a national policy to promote the development of domestically produced alternative energy sources to reduce our dependence on foreign oil.

Today, ethanol/gasoline blend sales represent over 8 percent of all motor fuels sold in the U.S. While ethanol was originally used as a gasoline extender, capable of stretching tight gasoline supplies, ethanol is currently marketed as a high quality octane booster capable of improving automobile

performance by adding 3 octane points with every 10% ethanol blend. In the future, we expect ethanol may be marketed as an ether based oxygenate - ethyl tertiary butyl ether (ETBE). ETBE has the potential of opening major new markets for ethanol because it can be blended at refineries and shipped through common carrier pipelines. In addition, ETBE can actually reduce the volatility of the base gasolines with which it is blended. While ETBE is not yet commercially available, it promises to be a valuable supplemental market to 10% ethanol blends and a natural competitor to the only ether based oxygenate available today - methyl tertiary butyl ether (MTBE).

Over the past ten years, ethanol blended fuels have won wide consumer acceptance as a high octane, high performance gasoline additive. In fact, since 1980, over 700 billion miles have been driven on ethanol blended fuels. One indication of the continuing and growing demand for ethanol blends are the market penetration levels in states where ethanol is sold. In 1988, 10 states recorded market penetration levels for ethanol that range from 16% to 39%. States with the highest market penetration levels are as follows: Kentucky, Iowa, Nebraska, Illinois, and Indiana.

Furthermore, ethanol blends are approved under the warranties of all 19 domestic and foreign automobile manufacturers marketing vehicles in the U.S. In fact, earlier this year, Roger B. Smith, Chairman of General Motors, announced that beginning with 1990 model cars and trucks, GM would begin recommending the use of oxygenated fuels. In making the announcement, Smith stated, "The advantage here is that the oxygen from the ether or alcohol portion of these special fuel blends can act to make the engine's air-to-fuel ratio leaner, (and) the result is less carbon monoxide." The new GM warranty language reads:

Gasolines for Cleaner Air

The fuel that you use can contribute to cleaner air. General Motors recommends that you use only gasolines treated with detergent additives that prevent deposit formation in your engine. These gasolines will help keep your engine in tune and your emission control system working properly.

The use of oxygenated materials in gasoline can also contribute to cleaner air, especially in those parts of the country where carbon monoxide and ozone levels are high. Where available, General Motors recommends use of oxygenated fuels such as MTBE and ethanol in gasoline.

The Air Quality Benefits of Ethanol and ETBE:

In recent years, the remarkable growth of the ethanol industry has been directly related to its increasing use as a weapon against air pollution for the nation's 90 carbon monoxide and ozone non-attainment cities. Many state and local governments are beginning to recognize the enormous environmental benefits of ethanol and are looking at programs to increase the use of ethanol blends as a means of reducing dangerous levels of carbon monoxide and ozone. One such program in Colorado has been highly successful in reducing CO in Denver's Front Range, previously the worst area for CO in the country. The success of this program has prompted other states, such as Arizona, New Mexico and Nevada, to adopt oxygenated fuel programs in their State Implementation plans to come into compliance with EPA standards.

Ethanol and ETBE have a number of air quality and public policy benefits which must be considered in the context of Clean Air Act reauthorization. First, because the oxygen content of an ethanol blend is almost twice that of other oxygenated fuels, its ability to reduce carbon monoxide (CO) levels is greater than any alternative oxygenated fuel. The use of ethanol blends will reduce motor vehicle emissions of CO by 25 - 30 percent. Second, recent analysis indicates that ethanol blended fuels can reduce the formation of urban ozone, a fact recognized by the U.S. Environmental Protection Agency as early as January, 1988. Finally, ethanol is an effective and safe replacement for dangerous aromatic octane enhancers in gasolines today.

Ethanol As A Carbon Monoxide Emissions Control Strategy

The addition of molecular oxygen contained in ethyl alcohol (C₂H₅OH) causes more air to be available in the fuel, thus the air/fuel ratio in the internal combustion engine is altered to the extent that the engine is more efficient in converting toxic carbon monoxide to non-toxic carbon dioxide.

Since 1987, EPA has recognized that the use of ethanol blends can reduce fleetwide carbon monoxide exhaust emissions by 25 percent. EPA published a technical document to be used by the States in revising their SIP's in the post-1987 era, "Guidance on Estimating Motor Vehicle Emissions Reductions From the Use of Alternative Fuels and Fuel Blends." This document lists the following exhaust emissions reductions that can be achieved by using ethanol blends:

non-catalyst (pre-1974 vehicles)	-22.8 percent
open-loop catalyst (1975-1981 vehicles)	-33.4 percent

closed-loop catalyst
(post-1981 vehicles)

-17.2 percent

Carbon monoxide is an intermediary component of combustion. Normally it proceeds to be completely oxidized into carbon dioxide (CO₂) during the later stages of combustion. But it can remain a pollutant if (1) the combustion gas temperatures are low; (2) if the duration of time it spends in the combustion process is short; and (3) if there is a lack of oxidants; i.e., oxygen-containing molecules. Increasing the air/fuel ratio present during combustion results in more oxidants being present and higher gas temperatures both of which increase the efficiency of the oxidation of CO into CO₂.

The higher the percentage of oxygen by weight in the fuel, the "leaner" the effective fuel-to-air ratio will be; that is, more oxygen is available to enhance the combustion process. As the fuel-to-air ratio becomes leaner, CO emissions are reduced. "Oxygenated" fuels produce a reduction in CO emissions directly related to the leaning effect they have on a vehicle's engine. The percentage of oxygen by weight in the automobile's final fuel determines the amount of CO emissions reduction. Hence, there is no question that ethanol blends substantially reduce CO emissions. This occurs because of the high oxygen content of ethanol. The oxygen content of gasohol is 3.5 percent by weight.

Indeed, to combat its significant CO nonattainment status, the State of Colorado, after several years of exhaustive analysis, promulgated a regulation which requires that only oxygenated gasolines be sold during the winter months along the Colorado Front Range.

The CO emissions reduction capability of oxygenates was corroborated in EPA testimony on June 17, 1987, before the House Subcommittee on Energy and Power, when the director of EPA's Office of Mobile sources stated that:

"Based on the types of vehicles in the in-use fleet today, our analysis indicates that the use of (oxygenates) would reduce motor vehicle emissions of CO by approximately 22 percent."

A tremendous amount of research to document the impact which oxygenated fuels have on CO emissions reductions is generally available.

Given the very few control options available for CO reduction it appears both reasonable and necessary that all CO nonattainment areas be required to either implement an oxygenated fuels program, or show why comparable emissions reduction will be obtained in the absence of such an oxygenated fuels program.

Ethanol, ETBE and Ozone Pollution Levels:

Ozone pollution continues to be a major concern for large urban areas throughout the United States. A recent analysis performed by SAI conclusively documents that reductions in carbon monoxide caused by ethanol blends in most instances completely offsets any increase in ozone formation attributable to the increased volatility of ethanol blends, and, in fact, at RVP's of 9.0 psi and lower, ethanol blends slightly reduce ozone formation.

Based on their review of SAI's analysis, EPA agreed that reductions in carbon monoxide should be considered with regard to ozone abatement efforts. In a January 1988 document EPA stated:

"Areas receiving ozone SIP calls and considering adoption of an alternative fuels program should account for its impact on both hydrocarbon and CO emission inventories, since both are inputs to the latest model for predicting future ozone attainment. Directionally, CO emission reductions from alternative fuels will assist in attaining the ozone NAAQS, but the strength of this effect has not yet been documented for the range of local conditions which affect ozone formation." (Guidance on Estimating Motor Vehicle Emission Reductions From the Use of Alternative Fuels and Fuel Blends, January 1988, at page 1) (emphasis added)

In order to further measure "the strength of this effect," EPA's Office of Policy, Planning and Evaluation (OPPE) contracted with Systems Applications, Inc., to perform more rigorous ozone modeling (using the Urban Airshed Model) to more fully ascertain the impact on ozone formation attributable to the use of ethanol blends. The initial results of this study are contained in the May 1989 report, "A Low-Cost Application of the Urban Airshed Model to the New York Metropolitan Area and the City of St. Louis." Although EPA has released this report, it has not been widely disseminated, and, quite frankly, I believe its conclusions have not received the attention due them.

In the computer modeling approach utilized in these studies, the Urban Airshed Model is employed in such a manner so as to take into account time-dependent chemistry associated with hydrocarbon emissions. This is a very important factor, given that many critics of ethanol blends contend that emissions from ethanol blend-fueled vehicles, while not as immediately photoreactive as gasoline-fueled vehicle emissions, form more ozone over time. The report indicated that this is not the case.

Of the various emissions inventories modeled in this study, included is a 1995 modeling scenario for New York City with 100-percent market penetration of a 10-percent ethanol blend with a

10.0 psi RVP (9.0 psi RVP base fuel, 1.0 psi RVP increase attributed to ethanol); and a 1995 modeling scenario for St. Louis with a 50-percent market penetration of a 10-percent ethanol blend with a 9.8 psi RVP (8.8 psi RVP base fuel, 1.0 psi RVP increase attributed to ethanol). Both modeling scenarios took running losses into account.

For the New York modeling scenario, the report states that, "There is a very slight increase in the maximum daily ozone concentrations, with a maximum increase of less than 1 part per billion... Examination of the difference in hourly ozone concentrations between the ethanol-blend scenario and the low-RVP scenario ... reveals that the effects of ethanol blends on hourly ozone concentrations are very small, with ozone increases or decreases always less than 1 part per billion."

For the St. Louis modeling scenario, the report states that, "the use of a 50-percent market penetration of a 10-percent ethanol-blended fuel with the 1.0 psi exemption results in no increase in the highest ozone concentrations and a slight increase in the maximum daily ozone concentration."

I believe these conclusions, based on the very best technical data base and computer modeling available in the country, are of significant importance to the ongoing debate on the impact of ethanol blends on ozone formation. I believe the results of this exhaustive and thorough study should put to rest, once and for all, the assertion that ethanol blends either now contribute to the ozone problem experienced in metropolitan areas, or would contribute to increasing ozone formation in those areas in which they gain an increased share of the motor fuel market. The plain and simple truth is --- ethanol blends don't contribute to the ozone problem.

These up-to-the-minute results, obtained by the use of state-of-the-art ozone computer modeling, should provide the Committee with further assurance that providing a volatility tolerance for ethanol blends continues to be the appropriate choice in the gasoline volatility section of the Committee's Clean Air Act legislation.

Impact of Lead-Phasedown and Aromatic Content Increase:

Gasoline, today, is a complex mixture of over 200 hydrocarbons. The hydrocarbon composition -- or octane level -- of fuel will determine the propensity of a gasoline to resist "knocking". The higher the octane number, the lesser the tendency of the gasoline to "knock". Over the years, as increased performance has been demanded from automobile engines, greater compression ratios in an engine's cylinders has been necessary, requiring higher and higher gasoline octane levels.

In the 1920's research determined that the octane level of fuel could be increased by the addition of tetraethyl lead. Research studies in the 1970's, however, discovered potential health problems associated with the use of lead in gasoline and on December 6, 1973, the U.S. EPA mandated reductions in the lead content of gasoline beginning January 1, 1975.

One result of the lead-phasedown program has been an increase in the aromatic content of gasoline as a means of replacing the lost octane value previously represented by tetraethyl lead. The aromatic fraction of gasoline has increased an estimated 50% in the last 8 years and EPA documents suggest that by the 1990's it is expected to double from pre-lead phasedown levels.

Moreover, the use of aromatics in gasoline will continue to increase as a result of EPA's fuel volatility standards. This increase in aromatic levels has raised serious concerns about the health and environmental implications of such components when emitted into the air. As more and more scientific information becomes available, the significant health risks associated with aromatic emissions becomes clear. Finally, the increasing percentage in gasoline of highly photoreactive compounds will continue to exacerbate the problem of ozone formation.

Therefore, it would appear that reductions in the aromatic fraction of current gasoline composition would have the beneficial result of not only reducing health risk to the public associated with these compounds, but if less photochemical reactive compounds were utilized in gasoline in their place, it would also assist in the reduction of ozone formation.

The three largest aromatic hydrocarbon components of gasoline currently are: benzene, toluene, and the mixed xylenes, known collectively as "BTX".

BENZENE: It is the basic aromatic in the BTX group. Highly valued as a chemical feedstock. It is estimated that the proportion of benzene in the domestic gasoline pool has increased by at least 50 percent since initiation of lead phasedown, and in fact, the liquid benzene level in gasoline has more than likely doubled in the past 15 years. It should also be noted that the upper range of liquid benzene content in gasoline is approaching 5 percent in summertime usage.

Benzene is a known carcinogen. The Senate Environment and Public Works Committee report on the Clean Air Act Standards Attainment Act of 1987 noted a study in Los Angeles that "as many as 222 cancers per year in that community could be attributed to toxic air pollutants, principally benzene emitted from gasoline supplies". Also, in a series of toxicological studies the effects of exposure to this hydrocarbon was

revealed. For instance, in a recent report released by California's South Coast Air Quality Management District, and funded by the U.S. EPA, researchers found that benzene posed the greatest health risk of all 16 air toxins studied. Study authors also concluded that there is a one in 10,000 chance of getting cancer from benzene exposure, and that 15 percent of those cases would be due to exposure during commuting to and from work.

TOLUENE: At significant exposure levels, toluene can produce impaired human motor functions and distortion of thought processes. It is the most common hydrocarbon octane enhancer purchased by refineries for use in increasing octane. Almost two-thirds of the airborne toluene emissions in 1978 were attributable to gasoline sources: gasoline refueling, automobile evaporative emissions, and automobile exhaust emissions. Consistent with the assumption applicable to populations at risk for exposure to airborne benzene emissions, it can be assumed that urban populations are exposed to larger amounts of airborne toluene from gasoline refueling and automotive emissions than non-urban populations, and sub-populations in close proximity to areas of congested traffic, service stations, and petroleum are at greatest risk.

As is the case with benzene, toluene levels in the domestic gasoline pool since lead phasedown have increased by at least 50 percent, and perhaps substantially more. The amount of isolated toluene used for octane enhancement was estimated at 290-300 million gallons in 1986, up 90-100 million gallons over 1985, accounting for 33 percent of total isolated toluene supply. Toluene ranks third in importance as a discrete octane enhancing blending agent for gasoline. Overall, of the 3.24 billion gallons of BTX supply available in 1986, after separation from the reformat supply stream, the 300 million gallons of toluene in gasoline represents 9 per cent of BTX supply with the balance used as petrochemical feedstocks.

MIXED XYLENES: The health effects of xylene are also well known. A 1984 EPA study, "Health Effects Assessment for Xylene," noted that pregnant women, and hence embryos, fetuses and young children, exposed to xylene should be considered a high risk sub-population.

Xylene is an aromatic compound which is a minor component of the BTX group. It has high value as a chemical feedstock. Mixed xylenes have increased in the domestic gasoline pool since implementation of lead phasedown by at least 70 percent, and perhaps substantially more at present time.

Because they are hydrocarbons, these aromatics, when released as emissions into the atmosphere, act as a chemical precursor (along with nitrogen oxides and sunlight) in the formation of ozone. Among the aromatics, however, there are

varying degrees of relative photochemical reactivity. Toluene, for example, is not very photochemically reactive. Benzene, is more photochemically reactive than toluene, but is only classified as a moderate precursor of ozone. The xylenes, however, are extremely photochemically reactive, and react in the atmosphere to form significant amounts of ozone in much greater proportion over shorter periods of time than do benzene and toluene.

Reformulating Gasoline:
Reducing Aromatics and the Benefits of Ethanol:

While the EPA lead-phasedown program was perhaps the first federally mandated reformulation of gasoline, the recognition of other environmental problems has re-focused attention on steps which can be taken to "reformulate" gasoline to assure a clean-burning motor fuel. Supporters of reformulated gasoline advocate that the concentration of certain gasoline components could be altered to achieve desired environmental benefits. As an example, reducing the level of xylene could reduce formation of ground level ozone and the addition of oxygenates would dramatically reduce tailpipe emissions of carbon monoxide. Some action, such as a proposed strategy by the U.S. EPA to reduce benzene emissions from stationary sources, has been taken to date, but there is much more which can and should be done.

While we all are encouraged by the current interest on the part of the U.S. oil industry to "reformulate" their product to respond to pressing environmental needs, as with the lead phasedown, it will take Congressional action to assure that "reformulated gasolines" meet maximum environmental standards. In the coming months, many definitions of reformulated gasoline will be offered, but we would suggest the following formulation:

Oxygen	3.1%	Minimum	(to reduce tailpipe emissions of carbon monoxide)
Sulfur	0.03%	Maximum	(to reduce acid rain)
Benzene	1.5%	Maximum	(to limit benzene levels)
Aromatics	25%	Maximum	(to limit photochemically reactive components)
Olefins	9-18%	Maximum	(to limit photochemically reactive components)
Rvp	9.0 psi	Maximum	(to reduce evaporative emissions)

The increased use of high octane-oxygenated blending components, such as ethanol, can go a long way toward reformulating gasoline to meet all of the above requirements while assuring the continued availability of high performance motor fuels which American consumers have come to expect.

Ethanol is an effective octane alternative for lead without the carcinogenic problems associated with aromatics. The addition of ethanol could proportionately reduce the amount of aromatics in the base gasoline and thus its presence for octane enhancement purposes can significantly reduce benzene levels in automobile exhaust.

Furthermore, non-benzene aromatics in gasoline, such as toluene, are precursors to benzene exhaust in the combustion process. Thus, not only does the addition of ethanol proportionately reduce the amount of aromatics in the base gasoline, its presence for octane enhancement purposes can significantly reduce benzene in automobile exhaust.

In addition to the environmental benefits, there are technical advantages to blending ethanol for octane as well. Some in the petroleum industry have suggested that one significant problem with the increased use of aromatics is the inability of heavier hydrocarbon ingredients to distribute octane evenly throughout the full gallon. The result is that the desired effect of a high octane level in the fuel is not achieved during the combustion process and performance is thereby affected.

With ethanol, that is not the case. As an alternative to aromatics, it has the ability to contribute significant octane to the front end portion of the gallon of fuel, thereby providing the proper distribution of the octane level needed while also substituting for the toxic aromatic components.

Ethyl Tertiary Butyl Ether (ETBE)

In the effort to reformulate gasoline, a new ethanol based fuel, ETBE (ethyl tertiary butyl ether) holds great promise. ETBE is a new oxygenated fuel that is produced by mixing ethanol and isobutylene and reacting the mixture over heat with a catalyst. Each gallon of ETBE contains 40% ethanol.

Today, approximately 15% of the nation's gasoline is blended with an ether-based fuel additive manufactured from imported methanol - MTBE (methyl tertiary butyl ether). As a new market for domestically produced ethanol, ETBE has several significant advantages over MTBE. ETBE is only slightly soluble in water and has higher octane compared to MTBE, so refiners could make high octane gasolines that can be shipped in pipelines. Also, ETBE's blending vapor pressure is low, and thus provides advantages in meeting seasonal fuel volatility standards. Finally, ETBE has a greater molecular weight than MTBE, increasing producer's flexibility and providing a higher quality oxygenated fuel.

The most likely market for ETBE blends would be as an oxygenated fuel and octane booster in PADD I and PADD IV. These

are coastal regions dominated by the major oil companies and established MTBE markets. There is presently no economic alternative to imported methanol as a feedstock for MTBE. However, domestically manufactured ETBE could compete with MTBE in established markets while opening new markets for ETBE blends in other regions of the country.

The domestic ethanol industry believes that over time ETBE may capture as much as 35% of the ether market. Given the lead time necessary for refiners to develop ETBE production capacity, and the growth pattern of the MTBE market, our industry estimates that an additional 350 million gallons of ethanol for ETBE manufacture may be necessary by 1995.

Because carbon monoxide (CO) reductions are relative to oxygen content, ETBE will not be as effective as 10% ethanol blends, which have an oxygen content of 3.5%. But ETBE will reduce CO emissions about 5% as much as ethanol blends while also reducing the vapor pressure of the finished gasoline. ETBE has a blending RVP of 4-7 psi, thus lowering the RVP of the blended product by about .2% in an 8% blend. This lower volatility will allow refiners greater flexibility in the use of butanes and will allow them to "reformulate" their gasoline by decreasing their reliance on aromatics.

Ethanol and ETBE have a significant number of environmental benefits. But they also have the ability to act as effective octane alternatives for lead and for toxic aromatic components. Ethanol and ETBE can be effective tools in any nationwide strategy to significantly reduce harmful gasoline benzene and aromatic levels in our fuel supplies, while maintaining the high-performance and high octane that American consumers have come to expect from their gasolines.

CLEAN AIR RESTORATION AND STANDARDS ATTAINMENT ACT OF 1989 - S.1630

S. 1630, legislation to reauthorize the Clean Air Act, contains several provisions that could have a significant impact on the production and use of fuel ethanol in carbon monoxide and ozone non-attainment areas. The Renewable Fuels Association is pleased to participate in this hearing to state our enthusiastic support for S. 1630. We believe this legislation provides the most cost-effective and environmentally sound strategy for reducing mobile source pollution of any proposals introduced to date and we look forward to working with the Committee in the next several months to assure passage of this important legislation.

Our comments will focus on the following key provisions:

- o Section 214 of the bill which requires nationwide reductions in gasoline volatility and provides a one-pound per square inch Reid Vapor Pressure tolerance for 10-percent ethanol/gasoline blends.
- o Section 217, which instructs the Secretary to promulgate regulations pertaining to fuel quality and, specifically, the addition of detergents and additives to prevent the accumulation of fuel deposits.
- o Section 218, which requires the use of oxygenated fuels during wintertime driving months; at an oxygen content level of 3.1 percent and with an oxygen credits trading program.
- o The requirement contained in Section 218 of the bill to label gasoline pumps which dispense oxygenated fuels.

One-pound RVP Tolerance for Ethanol Blends:

The Renewable Fuels Association has previously testified before the U.S. Congress, the Federal Environmental Protection Agency and several state regulatory and legislative bodies regarding various proposals to regulate the volatility of gasoline. The domestic ethanol industry has maintained a position in favor of a 1.0 psi waiver for ethanol blended fuels over and above a final RVP regulation adopted for gasoline. As such, we fully support Section 218 which requires a nationwide reduction in gasoline volatility and provides a one-pound per square inch Reid Vapor Pressure tolerance for 10-percent ethanol/gasoline blends.

There are three fundamental reasons why regulating the volatility of the base gasoline should be considered the preferable control option for controlling the volatility of ethanol/gasoline blends: First, regulation of the base gasoline recognizes that the increased volatility attributable to ethanol/gasoline blends is less than 1.0 psi RVP; second, because the volatility increase attributable to adding ethanol to gasoline is known, no legitimate environmental concern exists to justify imposing additional volatility control; and third, since the addition of 10% ethanol to gasoline raises the Reid vapor pressure of the finished blend, a requirement that ethanol-gasoline blends meet the same volatility standard as gasoline would necessitate the manufacture and distribution of special grades of "sub-RVP" gasoline with up to a one pound lower vapor pressure than other gasoline so that the finished blend met the volatility standard after the ethanol was blended. The production and distribution of special lower volatility or "sub-RVP" fuels would require that refiners incur significant additional costs associated with manufacturing, storing, and

transporting those non-fungible grades of gasoline. The numerous logistic and economic constraints would preclude the manufacture, storage and distribution of such sub-RVP gasolines, a fact recognized previously by EPA and this Committee.

Regulating the base gasoline to which ethanol is blended would provide significant volatility control. The certainty of physical chemistry provides the assurance that the addition of 10-percent ethanol to the base gasoline will not exceed 1.0 psi RVP. Furthermore, the added assurance that ethanol blenders must comply with Internal Revenue Service regulations controlling minimum ethanol content to qualify for an excise tax exemption, and the Clean Air Act itself which prohibits addition of more than 10 percent ethanol, alleviates any concern that the addition of ethanol to gasoline will result in different volatility levels than already recognized by EPA as adding less than 1.0 psi RVP to gasoline.

The fuel ethanol industry has developed as a result of the Clean Air Act Section 211(f) waiver granted in 1978 to ethanol-blended fuels. The industry's growth and existence has been and continues to be predicated on the so-called "gasohol" waiver. Admittedly, there are no volatility restrictions imposed on ethanol blends by virtue of the gasohol waiver. However, the industry has developed and operates pursuant to the law of the land as it now exists.

Investments in ethanol production plants have been made, and reliance by producer and customer alike have been placed on the viability and continuation of this waiver. Whatever one's position might be about the merits of the gasohol waiver itself, it cannot be denied that the fuel ethanol industry has justifiably relied on the waiver's existence as the basis for its growth in the fuel marketplace.

If ethanol blends are required to meet the same volatility standard as gasoline, it will mean the end of the fuel ethanol industry as it now exists. There are two primary reasons for this. First, the increase in refinery and distribution costs of a base gasoline for ethanol blending would eliminate the ability of ethanol blends to compete. Second, even if the increased costs did not kill the industry, the lack of distribution and storage facilities for a sub-RVP blendstock would make it impossible for ethanol blenders to continue in business.

If a uniform volatility standard is imposed on all motor vehicle fuels, ethanol blends will be unmarketable unless specially-tailored, sub-RVP base gasolines for each grade of gasoline are refined, stored, and distributed solely for blending with ethanol. It has been the consistent position of all those who have carefully examined the subject, that such sub-RVP base gasolines will not be available.

In order to permit blending with ethanol and remain within the same volatility standard set for gasoline, a refinery would have to produce a base gasoline with an RVP one psi lower than the non-blend standard. Various EPA and industry refinery consultants have estimated that the additional cost to refiners to produce such sub-RVP fuels would range from a low of 3 cents per gallon to a high of 11.9 cents per gallon. These added costs would wipe out any potential profit margin for ethanol blenders.

In addition to the cost factor, logistical problems would make ethanol blending virtually impossible. Ethanol blending occurs at terminal breakout points along the distribution system by mixing ninety percent gasoline and ten percent ethanol in a tank truck. In order to produce a blended fuel with the same volatility as gasoline, refiners would have to ship and store the special sub-RVP base fuel at points where it could be blended and delivered to retail stations. These sub-RVP base gasolines would have to be shipped through pipelines in a manner that would not allow for commingling with standard RVP gasolines. They would then have to be stored in segregated tanks at terminals. These shipping and storage facilities simply do not exist now, nor are they likely to exist in the foreseeable future. Nor can ethanol producers compel pipelines and terminal operators to build them.

These problems are real and the attempts by refiners to claim that sub-RVP base gasolines would be available "if economically warranted" do not address the reality that if an across-the-board volatility standard is mandated, ethanol blends will not be economically warranted.

Fuel Quality:

Section 217, which requires the Secretary to promulgate regulations establishing specifications for fuel quality which will minimize vehicular emissions and making it "unlawful to sell, offer for sale or introduce into commerce any fuel for use in a gasoline-powered vehicle unless such fuel contains additives effective in preventing the accumulation of deposits in fuel-injected engines" is long overdue and will assure a higher-quality, cleaner-burning motor fuel for American consumers.

In 1985, in order to help alleviate fuel injector system clogging caused by the high olefin content in some hydrocarbon gasolines, the domestic fuel ethanol industry initiated a program, at the request of the nation's largest automobile manufacturer, to add a detergent additive package to ethanol to help prevent the formation of deposits on port-fuel injectors and to keep carburetors clean. All ethanol sold in the U.S. today contains this high quality detergent additive package, making ethanol one of the cleanest high performance fuels in use today. The Renewable Fuels Association applauds the efforts of this committee to improve fuel quality.

3.1 Percent Oxygenated Fuels Program:

In almost all CO nonattainment areas, more than 90 percent of the ambient levels of carbon monoxide can be attributed to motor vehicle exhaust emissions. Hence, reductions in CO exhaust emissions obtained by using ethanol blends can have a substantial impact on an area's CO nonattainment status. For these areas, a vehicle-based CO attainment strategy, such as that contained in S. 1630, is the most effective CO attainment strategy.

In January 1988, EPA published a technical document entitled, "Guidance on Estimating Motor Vehicle Emission Reductions from the Use of Alternative Fuel and Fuel Blends." the purpose of this document was to provide emissions factors for each mobile source emission category, thus enabling state agencies to determine the emissions inventory for that portion of their respective mobile source fleet that used alternative fuels.

One of the emissions factors promulgated by EPA was exhaust carbon monoxide. According to EPA's analysis in January 1988, reductions in carbon monoxide exhaust emissions attributable to the use of oxygenated fuels was proportional to the amount of oxygen in the fuel. In other words, there is a linear relationship between increased oxygen content and decreased CO exhaust emissions. In that document, EPA indicated that a 3.7 percent fuel oxygen blend yielded 46 percent more reduction in CO exhaust emissions than a 2.0 percent fuel oxygen blend.

In response to the oil industry disputing the linear relationship fuel oxygen content and carbon monoxide exhaust emissions, EPA has recently completed additional analysis on this subject, and has incorporated its findings in a draft memorandum entitled, "CO Reductions Versus Fuel Oxygen Content." This draft memorandum, stated by EPA as presenting "the latest analysis of the effects of fuel oxygen content on exhaust CO emissions," was transmitted on February 24, 1989, by EPA's Emission Control Technology Division in Ann Arbor to various interested groups, including the Renewable Fuels Association and the American Petroleum Institute, for their review and comment.

EPA's draft memorandum analyzes carbon monoxide exhaust emissions data submitted by ARCO, Chevron,, the Colorado Department of Health, as well as data from EPA's own Emission Factor program. Based on their analysis, EPA reaches the following conclusion:

"These studies all indicate a trend of increasing percent CO reduction with increasing fuel oxygen content. In some cases the effect of 2.0 percent oxygen is somewhat greater than linear, while in other cases it is linear or less than linear. In every case, a straight line can be drawn within the 95 percent confidence limits of the data."

Therefore, from a strict environmental prospective, a 3.5 percent oxygen content provision such as that included in last year's Senate Clean Air Act Reauthorization proposal would provide the greatest CO reduction. However, because ethanol blends are the most economic fuel that can provide this level of oxygen content, opponents have argued that this would result in "an ethanol mandate." S.1630 resolves this issue by adopting the 3.1 percent oxygen standard.

The Renewable Fuels Association supports the adoption of a mandatory 3.1 percent oxygenated fuels program with an oxygen credits trading program. Such a program would provide for a mix of fuels and promote maximum flexibility. Those who market gasoline with an oxygen content exceeding the standard would have oxygen credits available to sell to those marketing gasoline with an oxygen content not meeting the standard. EPA has had extensive experience and success in administering and enforcing similar trading programs. The EPA's lead trading program was perhaps the first effort at using economic incentives to reduce the cost of meeting environmental goals, and the fact that lead has been virtually eliminated from gasoline is testament to that program's success. Thus, modeling the oxygen trading program proposed in S. 1630 after the successful lead trading program of the early 1980's would assure that neither EPA nor fuel marketers would be unfairly burdened.

Both state agencies and federal EPA are confident that such programs can be implemented. We would both caution and urge the Committee, however, to not adopt a final standard of less than the 3.1 percent oxygen contained in S. 1630. To do so would provide for unfair manipulation of the market balance between competing oxygenated fuels as well as forego much needed reductions in carbon monoxide emissions.

A National Pump Label for Oxygenated Fuels

The final provision of Section 218 would require EPA to promulgate a national, uniform pump label which identifies gasoline pumps that dispense oxygenated fuels. The labels are to notify consumers that "the fuel is oxygenated and will reduce carbon monoxide emissions from motor vehicles." Such a labeling program would ensure flexibility in the program by permitting consumers freedom of choice in purchasing these environmentally beneficial fuels. Moreover, this provision will not create any administrative burdens and will help less serious areas maintain CO compliance with a minimum of government involvement. Finally, by providing a nationwide oxygenated fuel label, consumers will be assured of obtaining accurate information.

The label contemplated by this provision will eliminate current consumer confusion created by the existing patchwork of

State labeling provisions which are both misleading and deleterious to the national goal of encouraging the use of oxygenated fuels.

CONCLUSION:

The Renewable Fuels Association enthusiastically supports S. 1630, and we commend the Subcommittee for recognizing the environmental benefits of ethanol and producing a far reaching and thoughtful legislative blueprint designed to enhance our national efforts to improve air quality.

Little more than a theory a decade ago, fuel ethanol has become a major industry in the United States. It creates new jobs. It helps the rural economy. It reduces government farm program expenditures. It lessens our dependence on foreign energy imports, and improves our balance of trade. It also improves our environment by lowering carbon monoxide emissions, slowing the formation of urban ozone, and providing an alternative to toxic aromatic compounds. By requiring the increased use of oxygenated fuels - S. 1630 takes a giant step toward cleaner air.

STEVE COWPER
GOVERNOR



STATE OF ALASKA
OFFICE OF THE GOVERNOR
JURRAU

October 16, 1989

The Honorable Max Baucus
Chairman
Senate Subcommittee on
Environmental Protection
458 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Mr. Chairman:

We wish to express our appreciation for your introduction of the Clean Air Restoration and Standards Attainment Act of 1989 (S.1630). If enacted, this legislation will greatly aid the efforts of our communities to reach attainment of the National Ambient Air Quality Standards.

We are very pleased to see the strong cold temperature carbon monoxide certification program that is contained in S.1630. As you know, the State of Alaska has consistently maintained that until cars and trucks can reduce emissions under normal operating conditions, many communities will be unable to meet standards for carbon monoxide. This is especially true for areas with colder climates. The program specified in S.1630 will provide substantial long-term CO reductions for communities across the nation.

It is reassuring to hear that you and a number of your subcommittee colleagues voiced strong concerns about the motor vehicle averaging provisions contained in the President's clean air bill (S.1490) to Administrator Reilly during your September 26 hearing. We strongly endorse the approach you have taken in S.1630 by specifically forbidding averaging, as we believe that all new vehicles should be equipped with the best available pollution controls.

We also wish to bring to your attention another problem we have faced in combatting our carbon monoxide problem. Several years ago, we recognized that the operation of some 6,000 vehicles in the State of Alaska -- vehicles that were not subject to our inspection and maintenance (I&M) program -- were contributing greatly to our carbon monoxide emissions, particularly during the months of November through March. Since these vehicles -- which belong to military personnel stationed in Alaska -- are registered in

The Hon. Max Baucus

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other jurisdictions, they were not subject to the State's I&M program. After considerable effort, we reached a "gentlemen's agreement" with the base commanders that has resulted in on-base emissions testing as a prerequisite for a base sticker.

While we are pleased with the accommodation we have reached with our military neighbors, we wish to point out that to our knowledge, our arrangement is unique. A number of other nonattainment areas have large numbers of either federal or out-of-state vehicles that contribute to their air quality problems. In addition, we recognize that our arrangement is just that -- federal law does not require that the out-of-state vehicles operated by military personnel and their families conform to the same requirements as must other vehicles. Thus, we ask that you consider amending the Clean Air Act to provide for testing of these vehicles in nonattainment areas. Toward that end, the Alaska Department of Environmental Conservation will be pleased to provide further information concerning the emissions testing program we have developed in cooperation with the local base commanders.

Enclosed with this letter is a summary of specific comments on provisions of S.1630 that directly affect carbon monoxide nonattainment areas. We ask that you take these comments into account as you develop amendments to the Clean Air Act.

Again, thank you for spearheading this important bipartisan approach to reducing motor vehicle emissions. We look forward to continuing to work with you and your committee colleagues as you move toward markup of clean air legislation.

Sincerely,

for John W. Katz
Steve Cowper
Governor

Enclosure

cc: Senator Ted Stevens
Senator Frank Murkowski
Senator John Chafee
Congressman Don Young

STATE OF ALASKA COMMENTS ON SPECIFIC PROVISIONS OF S. 1630

Sec. 188. (a) INVENTORIES

The State of Alaska is concerned with the need for additional resources and funding to carry out the increased planning efforts required by S. 1630. The Act would require the state to submit an emissions inventory for emissions occurring in the calendar year immediately preceding enactment of the bill or the subsequent year. As you are probably aware, we are currently under EPA mandate to submit an inventory for either the 1987 or 1988 calendar year. This change in base years will require additional resources and may involve some logistical problems in securing adequate travel and emissions data. We believe more thought needs to be given to how the planning efforts mandated in S. 1630 will integrate with existing federally mandated efforts. Perhaps the Administrator should be given latitude to allow different base years for areas which can justify the need.

Sec. 188. (b) MONITORING

Similarly, the mobile monitoring program mandated in this subsection will take substantial resources. Since all nonattainment areas will be required to commence such monitoring during the same 18 months, this may result in severe logistical problems. This will certainly be true in Region X, where the EPA Regional Office has historically rendered significant technical and fiscal assistance in such studies. While Region X has assisted many nonattainment areas in this region with mobile monitoring studies in the past, we are unsure whether this is true throughout the country. On a nationwide basis, this assistance would probably be inadequate if all CO nonattainment areas in the country are required to begin mobile monitoring during the same period of time. Depending upon the timing of the legislative enactment, this 18 month window may be drastically reduced to a four month wintertime period within that window, during which high CO levels occur.

Sec. 188. (c) EXISTING COMMITMENTS

The State agrees with the spirit of the requirement to "fully implement all provisions of any implementation plan for the attainment of the carbon monoxide air quality standard". We agree that the Act should differentiate between nonattainment communities that followed through with all of their State Implementation Plan (SIP) commitments and those that did not. However, we believe that the primary cause for not implementing SIP provisions is related to cost effectiveness. In an effort to demonstrate attainment, many communities claimed benefits for control measures that were either poorly understood or required substantial economic growth to fund their development (i.e., transit system development). With the benefit of hindsight, the estimated costs and benefits of these measures were quite optimistic. At present some communities may not be able to afford to implement all of the provisions noted in their SIP's.

Given this perspective, we believe that the Act should require communities to fully implement their original SIP commitments, however, they should be

accorded the flexibility to substitute more cost effective control measures if they are available. The following language (it is underlined) would accomplish this goal.

"(1) Not later than eighteen months after the date of enactment of this section each State containing an area classified nonattainment pursuant to section 187(a) shall fully implement all provisions of any implementation plan for the attainment of the carbon monoxide air quality standard for such area or areas which have been submitted to the Administrator for approval (whether or not approved) prior to the date of enactment of this section. In the event that a community determines that any of the unimplemented provisions are not cost effective, they may petition the Administrator for approval to use alternative provisions that provide an equal or greater measure of control. The Administrator shall not withhold approval for measures that provide an equivalent (or greater) percentage reduction in baseline emission levels.

Sec. 188. (d) AUTO REGISTRATION FEE...(e) STATIONARY SOURCE EMISSIONS FEE

The State has strong concerns regarding the auto registration and stationary source emissions fees which S. 1630 would mandate that the state collect. The Alaska Constitution, and perhaps other states' Constitutions, prohibit the establishment of dedicated funds, unless there is very clear statutory language regarding the use of the funds. In its current form the Act does not specify where the auto registration fees shall be used. Without this language, these fees would be deposited in the Alaska's general fund with no guarantee that they would be allocated to implement air pollution control programs. Therefore, we believe that S. 1630 should include additional clarification under both auto registration and stationary source emission fee subsections. We suggest that 188(d) and 188(e) both include the following:

"All revenues from any fee collected under this subsection shall be used by the state to fund air pollution control programs pursuant to section 110 and this part. Such use may include either expenditures by the state for the planning, development and implementation of CO control measures in applicable nonattainment areas, or the pass through of money by the State to local air pollution control agencies for those purposes."

This language would be added to 188(d) and replace the more general language in 188(e).

Sec. 188. (i) VEHICLE INSPECTION AND MAINTENANCE PROGRAM

The State supports the inspection and maintenance (I/M) program elements mandated in Section 183 of the Act. We believe that these elements, coupled with annual inspections and a good mechanics training program, will result in a very effective I/M program. However, we do not support the requirement that an I/M program reduces carbon monoxide emissions by at least 52,000 tons per million vehicles. A performance standard stated in these terms is essentially indecipherable to a local community. It increases a community's reliance on EPA's models to determine the effectiveness of their program. The State

believes that this will not improve I/M program effectiveness. Instead, it could lead to more paper analyses of program effectiveness and less effort spent on improving program fundamentals.

At present, EPA is charged with the responsibility of assessing each program's effectiveness. Regardless of the performance standard that is mandated, EPA will remain responsible for assessing a program's effectiveness, either directly or through the development of a model to assess program performance. Thus, specifying a performance standard will not change the current situation, either EPA approves or disapproves of a program's performance. Therefore, the primary concern of the Act should be to mandate the essential elements of an effective I/M program and leave responsibility to EPA to ensure that the programs are correctly implemented.

Sec. 188. (j) OXYGENATED FUELS

The State is concerned about the effect that oxygenated fuels may have on the driveability of vehicles at the extremely low temperatures (well below 0°F) experienced by Alaskan and certain other northern nonattainment communities during the winter. A study* conducted by the Coordinating Research Council (CRC) on the effects of altitude and oxygenated fuels on low-temperature (ranging from 10°F to 40°F) driveability showed that performance decreased significantly with declining ambient temperature, and that fuels containing oxygenates performed significantly worse than fuels containing hydrocarbons only. We are in the process of funding a cold temperature oxygenated fuels driveability test program that will be conducted in the Fairbanks North Star Borough this winter. The primary purpose of the program is to determine whether there are unacceptable driveability problems with alternative levels of oxygenate blends.

Given this background, we believe that the mandate for a "3.1 per centum or greater" oxygen content should be reduced to 2.0 per centum or greater oxygen content. By specifying a lower level of oxygenates, the Act would allow communities the flexibility to determine the level of oxygenate content that best matches the requirements of local driving conditions.

The State is aware that the CO benefits of oxygenated fuels are minimized in late model vehicles equipped with closed-loop controls. In private conversations, manufacturers have indicated that vehicles equipped with adaptive learning features will experience even lower CO benefits from oxygenates. The State is concerned that the benefits of an oxygenated fuels program will decline over time as older vehicles are replaced with those equipped with adaptive memory

* "1988 CRC Volatility Program on the Effect of Oxygenated Fuels and Altitude on Driveability at Low Ambient Temperatures," (CRC Project No. CM-188-88), May 1988.

features. At present manufacturers do not routinely identify individual vehicles or even vehicle models with adaptive learning features. Thus, it is impossible to determine the fraction of the vehicle fleet equipped with this technology. EPA has developed a data base with information on the CO reductions from oxygenates by model year group. However, they have not conducted an evaluation of the effects of oxygenates on alternative technology vehicles.

Given the mandate to use oxygenates and concerns about the CO reductions that can be achieved with a technology that represents a growing portion of the motor vehicle fleet, it would be prudent to require EPA to quantify the effect of adaptive memory features on the CO reductions that can be achieved with oxygenates. If in fact the CO reductions associated with oxygenates decline as expected, EPA should be required to provide guidance to communities so that they can determine whether oxygenates will continue to be a cost effective CO control strategy. The program should be modified so that the Administrator is required to determine, once every 5 years, whether the benefits of oxygenates continue to justify a mandatory requirement.

Sec. 202 (h) COLD CO STANDARD

The State is pleased to see the strong cold temperature CO certification program contained in S. 1630. The State along with the cities of Anchorage and Fairbanks continue to support this program as the primary means of CO attainment for our nation's cities. Certain key elements of this program will ensure maximum effectiveness throughout the country. These include:

- certification at 20°F;
- coverage of both light-duty vehicles and trucks;
- a reduction greater than 90% in cold temperature emissions from 1970 baseline levels.

The cold temperature emission standards contained in S. 1630 combine fairly rapid implementation of interim standards for cars and trucks with more stringent long-term standards. This provides sufficient lead time to the manufacturers while ensuring that the nation's communities get the quickest, largest benefit achievable from this program.

In contrast, S. 1490 provides no assurance that the more stringent long-term standards will be implemented, leaving the decision to the discretion of the Administrator. The figure that follows these comments provides an example of the effect of this difference on the attainment prospects for the nation's cities. Assuming no reduction due to a long-term standard for S. 1490, it is projected that Fairbanks attainment period will double, from 9 to 18 years, if the long-term provisions contained in S. 1630 are adopted. This difference becomes very important in light of the 20 year attainment horizon required in Section 110 for maintenance of an air quality standard.

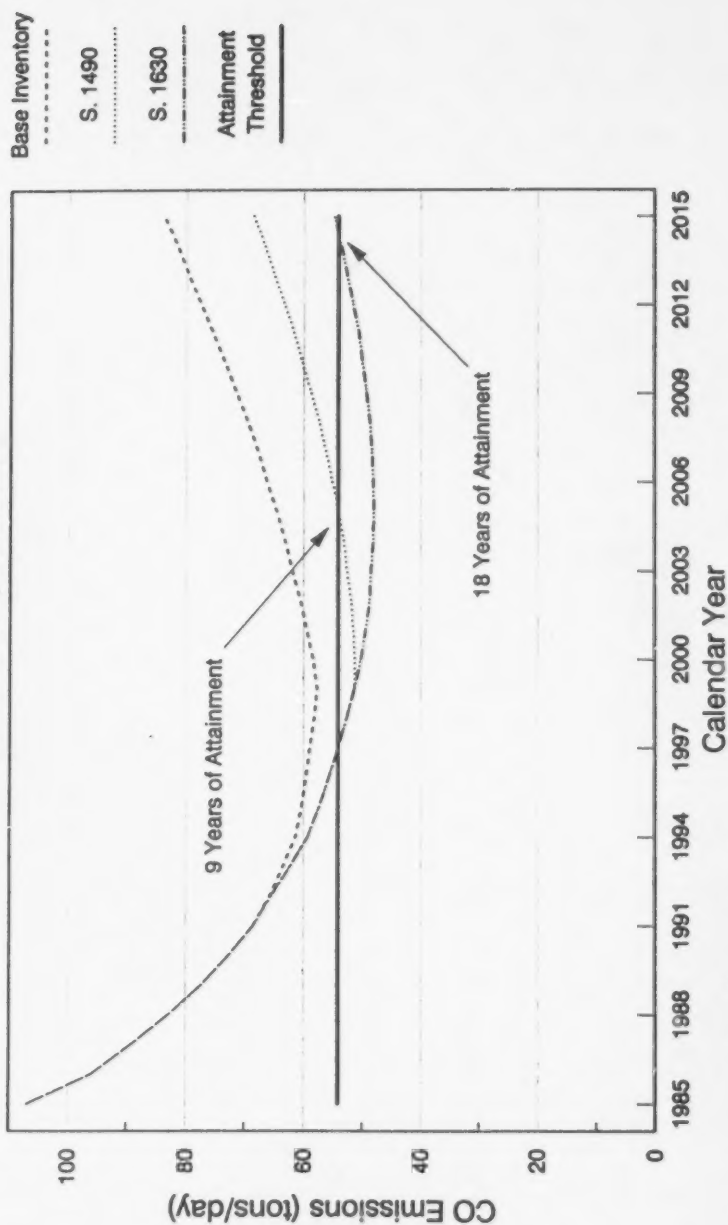
This projection includes credit for an enhanced I/M program (already in place

in Fairbanks), but does not take into account any other new CO control strategies such as a mandate to use oxygenated fuels during the winter. The figure also shows that growth in travel will necessitate the maximum effectiveness possible from a cold temperature control program, as well as additional measures, in order to achieve and maintain the ambient CO standard in Fairbanks. Other areas with higher design values and vehicle growth rates will need the maximum benefits from cold temperature CO control even more.

Sec. 202. (u) AVERAGING PROHIBITED

We are also pleased that none of the averaging provisions contained in S. 1490 are included in S. 1630. We compliment the Committee for the inclusions of a specific averaging prohibition in the bill. Allowing such averaging would dramatically reduce the effectiveness of both current and proposed emission standards.

Impact of Alternative Cold Temperature CO Proposals on the Attainment Prospects of Fairbanks, Alaska



Note: Based on MOBILE4 estimates of motor vehicle emissions at 20 Degrees F.

STATEMENT BY

ROY ROMER
GOVERNOR OF COLORADO

BEFORE THE SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

OCTOBER 4, 1989

Thank you, Mr. Chairman. I appreciate this opportunity to comment on the non-attainment provisions of the federal Clean Air Act.

As you know, I have submitted testimony on this issue several times since I took office in 1987. I also have sent letters to members of this and other committees in both houses of Congress. I have done this because air quality is among the most important challenges facing Colorado. We are determined to meet the standards set by the federal government and to improve significantly the quality of our air.

We have made important progress in air quality in Colorado. Carbon monoxide violations in the Denver area have decreased from more than 130 days per year in the early 1970s to eleven in 1988. We have adopted a stringent inspection and maintenance program, metrowide woodburning bans, and the nation's first oxygenated fuels program. We also are implementing an ambitious 10-point plan to reduce metropolitan Denver's visible pollution by the year 2000.

Despite these efforts, portions of the Front Range of Colorado, where our major population centers lie, do not meet federal standards for carbon monoxide or particulate matter (PM10). While we will continue to search for and implement new air quality strategies, it is evident that we cannot attain nor maintain federal standards without some further assistance from the federal government.

We have been very encouraged by the news earlier this week of a compromise over in the other house on these matters. It is good news for air quality. I want to commend Representatives Dingell and Waxman. I hope that same spirit of compromise and cooperation can characterize all our efforts on this issue.

Colorado's conditions of high altitude and cold climate make our clean air problems distinctive. I therefore would like to review what it is we need out of the Clean Air Act to help in our fight for clean air. To keep the momentum, we must be provided with tools applicable to the unique conditions we face.

In a letter to this committee in June I outlined a series of provisions which Colorado would like to see in a new Clean Air Act. Today I want to review those provision, some of which have been included in the various proposals in the two houses.

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First, while it is important to extend the deadline for attainment of carbon monoxide standards, we urge you to include a provision requiring steady progress toward that goal. We need to be realistic. But we cannot afford to relax the pressure on non-attainment areas to come into compliance at the earliest possible date.

Second, we urge you to consider requiring EPA to increase in-use testing of all vehicles, including heavy-duty vehicles, with an explicit requirement that EPA conduct testing at both high and low altitudes. Without in-use testing at high altitudes, evidence demonstrating violations of tailpipe emission standards is not available. The proper enforcement of tailpipe standards requires high-altitude testing.

Third, we believe that light-duty trucks should be required to meet the same carbon monoxide standard required for cars. In Colorado, nearly 40 percent of all new vehicles are light-duty trucks, yet the standards for these vehicles are less stringent than those for automobiles. There is no technological reason for this difference. Carbon monoxide standards for heavy-duty vehicles should also be strengthened.

Fourth, we believe severe non-attainment areas should be required to mandate the use of cleaner burning fuels. Colorado was the first state to mandate the use of oxygenated fuels during the winter high pollution season. These fuels have reduced ambient carbon monoxide levels by 10 percent or more, and we are proud of our leadership in this area.

Fifth, we believe that warranties on automobile emission devices should be extended from the current 5 years or 50,000 miles to 10 years or 100,000 miles. This is one of the most important items, and I am delighted that this was included in the Dingell-Waxman compromise. New cars simply stay on the road longer these days, and we need the assurance that they will stay clean throughout their lives.

Sixth, we believe that manufacturers should be required to certify reasonable carbon monoxide standards for cold weather operation and "cold starts." Again, this is one of our top priorities. Currently, vehicles are certified at between 68 and 86 degrees Fahrenheit. This does not address Colorado's needs, because our high pollution season falls during the cold weather months. In Denver, excess emissions during cold start periods account for a majority of the carbon monoxide in the central city during evening rush hours.

Seventh, we believe Congress should establish more stringent tailpipe emission standards for carbon monoxide. The new standard should be set between 1.5 and 2.0 grams per mile, depending on cost and available technology.

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Eighth, we believe the federal standards for NO_x for automobiles and light-duty trucks should be tightened to the maximum extent feasible. NO_x is a precursor to secondary particle formation and these particles are an important component of Colorado's brown cloud. By essentially settling on the California standards for this pollutant, the House compromise is a very positive step in this direction.

Ninth, we believe EPA should be directed to conduct rule-making every four years for both carbon monoxide and NO_x to determine whether technological advances allow further tightening of tailpipe standards. Given the rapid advances in technology, I do not believe it is appropriate to lock ourselves into a standard that may not change for a decade or more.

Tenth, Congress should allow data gathered from state's inspection and maintenance program to be used as a basis for EPA's 207(c) manufacturers' recall program.

Eleventh, the federal government should set diesel fuel standards for sulfur content and aromatics by December 31, 1990. In 1988, the Governor's Blue Ribbon Diesel Task Force recommended a diesel fuel standard limiting sulfur to .05 percent be implemented for Colorado if EPA did not finalize a similar regulation by this date. We are encouraged by recent EPA proposals in this regard, but I believe we should keep the pressure on.

Finally, and perhaps most important, we believe Congress must clarify the provisions of the act which deal with transportation plan approval to ensure that priority is given to air quality in the transportation planning process. A majority of our carbon monoxide pollution and as much as 50 percent of metropolitan Denver's brown cloud is transportation related, and vehicle miles traveled in metro Denver are projected to double by the year 2010. I have made air quality considerations central to highway planning efforts. We believe the federal government also must provide an incentive for investment in projects that provide air quality benefits, especially in non-attainment areas.

We believe these items should be included in the Clean Air Act if that legislation is to address our unique problems. Through programs such as mandatory oxygenated fuels and inspection and maintenance programs for diesel and gasoline vehicles, we have shown our determination to improve air quality in Colorado. The citizens of Colorado are willing to do their part, but they cannot do it alone. We need your assistance in the form of a strong and effective Clean Air Act.

Again, thank you for inviting me to testify. I appreciate your consideration of these important measures for Colorado.

STATEMENT

OF

DON FUQUA

President

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

submitted for consideration by the
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

in connection with Committee consideration of the
Clean Air Restoration and Standards Attainment Act of 1989

October 20, 1989

The Aerospace Industries Association of America, Inc. (AIA) is the trade association representing the nation's leading manufacturers of commercial, military and business aircraft, helicopters, aircraft engines, missiles, spacecraft, and related components and equipment. Our members include 54 companies operating in all 50 states. We appreciate the opportunity to submit comments regarding the proposed Clean Air Restoration and Standards Attainment Act of 1989.

The Aerospace Industry

The aerospace industry is located in a number of non-attainment areas throughout the country, including: Atlanta, Boston, Chicago, Dallas/Fort Worth, Denver, Detroit, El Paso, Houston, Kansas City, Los Angeles, Newark, New York, Philadelphia, Phoenix, Pittsburgh, St. Louis, San Diego, and Tulsa. Over 40 percent of aerospace employment is located in the Pacific region, of which over half is in California, the majority in the greater Los Angeles area.

The aerospace industry is a vital part of our national economy. In 1988 the industry contributed \$111 billion to the GNP and provided employment of 1.3 million. Aerospace exports totaled \$26.9 billion resulting in a positive trade balance of \$17.9 billion.

Aerospace operations are extremely diverse. Aerospace products range from large aircraft, such as the Boeing 747, the McDonnell Douglas MD-11 and the Rockwell Space Shuttle, to a variety of smaller, highly specialized products such as satellites and missiles. The industry also produces a range of other high technology products, such as radar systems,

optical and communications equipment, and a number of other electronic components and systems.

The vast majority of ozone precursor emissions from aerospace operations result from the use of coatings and solvents. Although it is difficult to estimate actual emissions, we estimate that national volatile organic compound (VOC) emissions from aerospace coating and solvent applications is in excess of 200 tons per day.

The manufacturing process for such products is usually cyclical and non-standard. The period of time from initial product design to actual production can constitute several years. Furthermore, as a product moves from the design stage through the production stage, the rate of production may vary significantly. Only a few aircraft, for example, are typically produced in the early years of a product's development. Even during later years, funding decisions may affect production levels. Therefore, production rates, and associated emission levels, will fluctuate markedly from year to year.

Even during a steady production phase, a facility's emissions rate will fluctuate on a day-to-day basis, especially in the case of larger aircraft production. This irregularity is due to the fact that the assembly process usually requires the confluence of hundreds of thousands of individual, carefully sequenced steps, performed by several hundred to thousand subcontractors located in every state of the nation, before a product can be completed. In many instances, a single product may be completed only once every few months. Since coatings and solvents are applied for different purposes and to various component part types throughout assembly, there is no representative mix of coatings and solvents that would be used on a daily basis.

Coatings and solvents applied by the industry represent more than 30 years of technological development. Current military and commercial specifications require contractors to use those coatings and solvents that meet high standards of performance. Because of the stringent performance, safety and contract requirements of most aerospace products, it has proven difficult to identify acceptable substitute low-VOC formulations for all coatings and solvents. For example, acceptable alternative materials do not currently exist for many specialty coatings and solvents, which perform such functions as structural adhesion (e.g., adhesive bonding primers), corrosion prevention (e.g., fuel tank coatings), or thermal protection (e.g., certain spacecraft coatings).

Notwithstanding the difficulty of reformulating materials, the industry has successfully identified and evaluated for near-term use several low-VOC primer formulations for its commercial and military applications and is

optimistic about approving for use a low-VOC topcoat formulation by the early 1990s. Except for maskants, the primers and topcoats represent by far the highest volume of coating usage. The industry's success in reformulating its high-volume materials has largely been attributable to an ambitious research and development effort devoted to identifying, testing and qualifying the use of new low-VOC materials. Since the early 1970s in the South Coast Air Basin, VOC emissions from the industry's solvent and coating applications have been reduced by approximately 60%, or 15 to 20 tons per day, primarily through conversion to low-VOC materials, improvements in transfer efficiency, and selective installation of control equipment.

Although the industry has achieved considerable emission reductions by these methods, it is concerned that the nation's VOC reduction strategy may not be compatible with other environmental objectives. For example, a large number of the most readily available low-VOC coating and solvent formulations contain chemicals that may be subject to review under the hazardous air pollutant provisions of an amended Section 112 or that are or may soon be subject to national and international regulation as stratospheric ozone depleters (e.g., chlorofluorocarbons (CFCs) and methyl chloroform). The aerospace industry wishes to ensure that progress it makes in reducing VOC emissions not come at the expense of other environmental priorities.

Specific Comments

1. The bill should require EPA to issue an integrated control techniques guideline (CTG) for aerospace coatings and solvents.

The aerospace industry firmly believes that, with the proper amount of time and planning, it can achieve ambitious levels of VOC reductions at its facilities throughout the country without sacrificing either the performance and safety of its products or other environmental objectives, such as the protection of the public against ozone depletion or unreasonable exposure to hazardous air pollutants. To assure that these multiple goals are met, however, EPA must provide to the states and the industry comprehensive, integrated guidance; that is, guidance that addresses both VOC reduction strategies and their relative desirability from a hazardous air pollutant or ozone depletor perspective. Without such guidance, the states and industry would waste considerable resources and an important opportunity for significant environmental gains would be lost.

The industry's request for national guidance for aerospace coating and solvent applications is not new. As early as 1985, AIA and its members urged EPA to work with industry, the Department of Defense (DOD), the Federal

Aviation Administration (FAA) and the National Aeronautic and Space Administration (NASA) to develop such national guidance in the form of a control techniques guideline (CTG). To assist EPA, the industry also retained Radian Corporation and conducted an extensive study of its coating and solvent emissions. The industry's two-volume report on alternative VOC reduction strategies was completed in 1986 and provided to EPA.

One of the first reasons for the industry's CTG request was to obtain EPA assurance that the reformulation approach¹ to VOC reductions would remain the preferred emissions control strategy. The reformulation of coatings and solvents is the most desirable VOC reduction strategy for the aerospace industry for environmental as well as economic reasons.

Reformulated, low-VOC coatings and solvents can yield significant environmental benefits across the country. Unlike many other manufacturers, aerospace manufacturing requires that manufacturing tasks be divided among thousands of subcontractors in every state of the nation. An individual subcontractor cannot alter a coating or solvent unless the change has been approved in advance by the prime contractor and, in many cases, the customer. However, once the prime contractor and its customer approve a material change, in most cases, each of the subcontractors can convert to the new material and realize comparable VOC emission reductions. Thus material reformulation produces a powerful multiplier effect: environmental progress flows nationwide through the entire contracting chain as VOC reductions are achieved at relatively low cost to each individual manufacturer.

The reverse is true if the installation of add-on control technology (such as carbon adsorbers, scrubbers or incinerators) is selected as the primary means of reducing VOC emissions from aerospace facilities. Under the latter scenario, each aerospace contractor would be required to install such equipment at each facility located in a non-

¹ Notwithstanding the technical challenges of reformulating high technology materials, the industry already has identified a number of alternative materials that do not appear to have potential adverse environmental impacts. In many cases, however, the very best alternatives from an environmental perspective often require a longer period of time to develop, because, among other reasons, they often require the use of a different resin system. The greater the change in the material formulation, the more important it is for the industry to assure through laboratory and field tests that such materials will deliver continued product safety and performance.

attainment area. Not only would the associated capital investment discourage continued investment in reformulating materials, but the add-on control approach would yield no environmental benefit at points in the contracting chain other than those that install control hardware. Furthermore, the relative aggregate cost of achieving VOC reduction through the add-on control approach compared to the reformulation approach would be staggering. This is not to suggest that the selective installation of add-on controls is unreasonable. In fact many aerospace facilities have opted for such controls when their installation is cost-effective.

In addition to its lower total cost as a national VOC reduction strategy, reformulation is a vastly preferred alternative because it may not be feasible or cost-effective to install add-on controls at many aerospace facilities. One reason for this conclusion is that approximately 50% of aerospace VOC emissions are "fugitive" in nature. These are VOC emissions that do not occur within a paint booth, degreaser or other point at which emissions can readily be collected for destruction, adsorption or other means of control. In such circumstances the only reasonable means of reducing emissions is to reformulate the material.

A second reason for this conclusion is that, even when the VOC emissions occur at a point where they can be collected, the conditions for control are often poor. This is due primarily to the fact that aerospace paint booths must handle of wide variety of part sizes, from very small to very large. The VOC concentration of the air stream from such booths is often very low (i.e., very dilute) and the air flow is very high (to ensure worker safety). High air flow and low VOC concentrations make VOC control very cost-ineffective, often an order of magnitude higher than the costs of controlling emissions from other paint booths. While the use of carbon adsorption in a standard industrial paint booth may cost approximately \$3,000 per ton of VOC removed, the average cost-effectiveness for many typical aerospace paint booths would be approximately \$20,000 to \$40,000. In extreme cases, it could cost up to \$500,000 per ton of VOC removed to control very large aerospace paint booths. And in many such cases, the air flow would be so high and the VOC concentration so low that very poor control efficiency would be achieved.

Given the obvious benefits of reformulation and the limitations (in cost and feasibility) of add-on control technology, the industry has tried hard to encourage material reformulation. Successful material reformulation requires a number of conditions, however. For the reformulation approach to work, we need to:

- 1) resolve conflict between customer (DOD, NASA and FAA) specifications and emission limitations,

- 2) promote research and development by coating and solvent suppliers,
- 3) achieve a greater degree of uniformity among state regulations, and
- 4) harmonize potentially conflicting regulatory programs (i.e., ozone attainment, toxic air contaminants and ozone depletion).

In our judgment, by far the best way (and perhaps the only way) to satisfy these conditions and achieve significant VOC reductions through reformulation is for EPA to issue national guidance in the form of a CTG that specifically addresses aerospace coatings and solvents.

Accordingly, the aerospace industry respectfully requests that S.1630 be amended to require EPA to develop a CTG specifically for aerospace coatings and solvents, after consulting with the industry, DOD, NASA and the FAA and after taking into account the applicable requirements of Section 112 (hazardous air pollutants) and the need to protect stratospheric ozone.

2. The bill should preserve a state's discretion to deviate from previous CTG guidance where the state finds such guidance to be inadequate for particular sources or source categories.

In 1978 EPA issued a CTG for miscellaneous metal parts and products. This CTG served as a catch-all CTG for coating applications not otherwise addressed by EPA. Its breadth was unparalleled, covering almost 100,000 facilities and nine major Standard Industrial Classification (SIC) codes, including electronics and transportation, into which aerospace falls. The CTG thus covered such wide-ranging products as typewriters, crock pots and small farm machinery.

When it issued this CTG, EPA advised the states that the guidance was highly general in nature and that states, consistent with Section 110 and Part D of the Act, could deviate from the CTG guidance in appropriate circumstances. Several states in fact chose to deviate from the CTG when they adopted Reasonably Available Control Technology (RACT) measures for aerospace operations, after having found that the metal parts CTG had made general assumptions (about the availability of acceptable low-VOC materials or the feasibility or cost-effectiveness of add-on controls) that did not apply to aerospace coating and solvent applications.

Many of the states that have adopted or wish to adopt aerospace-specific regulations need the flexibility in the

current Act to deviate from CTG guidance in appropriate cases. This discretion is especially important if EPA is to issue prospective guidance on aerospace-specific applications in the near future.

The bill would add Section 182(b) to the Act, requiring the states to correct current plan deficiencies, including the adoption of RACT for existing CTG categories. The clear intent of this section is to require that nonattainment areas impose RACT for all significant VOC source categories. There does not appear, however, to be an intent to deprive the states of their discretion to craft RACT provisions of their own choosing, based on their own judgment about technical and economic feasibility, among other factors. We believe the bill should clarify that this new section would not remove a state's discretion, in appropriate circumstances, to deviate from an existing CTG.

3. The bill should authorize EPA and the states to establish reasonable (i.e., representative) emission baselines for sources (such as aerospace facilities) whose emissions often vary significantly from year to year.

Proposed Section 173(c) would provide that offset credit for emission reductions be calculated based only on reductions in actual (i.e., historic) emissions. Such an approach could have the unintended effect of confiscating some or all of the emissions entitlement of sources whose emissions are irregular.

Aerospace facility emissions often fluctuate widely from year to year due to varying demand and to the long time period from initial product development to full-scale production. Actual annual facility emissions may vary by hundreds of tons, depending on the facility's level of production during any given year.

Aerospace facilities also undergo permit review frequently (sometimes as frequently as 10 times in a single month) as they modify individual pieces of equipment to incorporate improvements in product design or changes in material formulation or in the manufacturing or assembly process. If projected (i.e., post-modification) emission increases are measured against actual (i.e., historic) emissions on each such occasion, a facility will gradually lose much of its authority to emit² if pre-modification emissions were at low, unrepresentative levels.

² The same phenomenon occurs when an offset ratio in excess of 1:1 is applied to equipment modifications or facility relocations.

This problem can be resolved by allowing the Administrator or other permitting authority to calculate an emissions reduction by reference to the facility's representative or allowable level of emissions.

4. The bill should preserve the reasonable use of "bubbles" in non-attainment areas.

S.1630 would not prohibit the use of emissions bubbles, or emissions averaging, as an alternative means for a stationary source to comply with RACT. Indeed, by enacting more stringent emission reduction requirements, S.1630 would increase the need for bubbles.

However, EPA's December 1986 Emissions Trading Policy, which did not undergo formal rulemaking but would remain in effect if S.1630 is enacted, would severely restrict the use of bubbles by requiring sources that use emissions averaging (1) to use the lower of actual or RACT-allowable emissions as a baseline, (2) to average emissions over a period no greater than 24 hours, and (3) to achieve a net 20% additional emissions reduction. Some states, including California, have not yet incorporated these new emissions trading restrictions because, as a practical matter, few emissions trading opportunities would qualify.

For example, aerospace facility emissions are irregular from day to day and year to year. Therefore, an actual emissions baseline and 24-hour averaging period would thwart most practical emissions averaging options for an aerospace source. The actual emissions baseline would prevent sources whose production levels are on the increase from using emissions averaging, because their future emissions would of necessity exceed the facility baseline.

Similarly, a 24-hour averaging period would prevent a source from balancing the use of low-VOC coatings on one day against a higher-VOC coating on another day. If the higher-VOC coating is the only one used within a particular 24-hour period (no matter how low the facility's total emissions that day may be), the facility could not use emissions averaging to comply.

Finally, many aerospace plants are located in areas already subject to stringent control, such as the South Coast Air Basin, where it may not be possible to achieve an additional 20% emission reduction beyond RACT levels unless one were to curtail and shutdown operations. Therefore, they would usually be unable to meet the third condition of the Emissions Trading Policy.

We urge the Committee to preserve the emissions averaging option for sources who cannot meet specific RACT

requirements or who otherwise wish to achieve emission reductions in a different (and often more cost-effective) manner than provided by RACT.

We respectfully request that the bill be amended to provide that a stationary source may comply with RACT by alternative means so long as its emissions are in the aggregate equal to or no greater than emission levels or rates that would be allowed under the applicable RACT provisions, measured over a period of no greater than thirty days.

5. The bill should provide for offset ratios that reflect levels of control already achieved.

As drafted, S 1630 would impose an offset ratio of 1.5 or 2 to 1 in serious, severe and extreme nonattainment areas, regardless of the level of control already achieved by the equipment at which the offsetting emissions reductions occur.

The aerospace industry supports the use of offset ratios greater than 1 to 1 in situations where uncontrolled or under-controlled equipment is shut down or controlled to support emission increases elsewhere. In such cases, the offset ratio captures some of the emission reductions that could have been obtained had the old equipment been controlled.

However, if the source of offsets is equipment that already has been controlled to at least RACT levels, then applying an offset ratio greater than 1 to 1 has a different effect. Instead of capturing a portion of emission reductions that could have been achieved through reasonable controls, applying the higher ratio reduces productive capacity. That is to say, when a unit's emissions already are "lean" (i.e., at or near the lowest level necessary to allow the unit to operate), there are no "excess" emissions to capture. At that point, a ratio greater than 1 to 1 reduces emissions at the cost of reducing productive potential.

We recommend that the bill impose offset ratios that reflect the level of control already achieved. Using this approach, a 1 to 1 ratio would apply if the equipment being shut down (or over-controlled) already had met Lowest Achievable Emission rate (LAER) or Best Available Retrofit Technology (BART) levels. If the equipment had met RACT requirements, a ratio no greater than 1.2 to 1 might apply. If the underlying equipment had not been controlled at all, then a higher offset ratio would be appropriate.

6. The bill should confirm that facilities may use inventory methods to track emissions.

S. 1630 also proposes a new Section 173(b), which would create a new operating permit program. Paragraphs (1)(A) and (B) of this section require that the permit contain appropriate "monitoring measures." Presumably, this language would allow a source to use procedures other than actual sampling of air emissions, especially when a source's emissions do not occur at a stack or other common point at which sampling could reasonably be conducted.

We recommend that the bill be amended to clarify that a source could use inventory methods to provide an estimate of emissions in lieu of actual emissions monitoring. The requested clarification is critical for the aerospace industry, because, at many of its facilities, up to fifty percent of the total coating and solvent emissions are "fugitive" in nature and could not reasonably be monitored. Furthermore, because aerospace coating and solvent applications occur intermittently and result in very low VOC concentrations, monitoring such an air stream could be technically difficult and monitoring results would very likely be nonrepresentative of actual emissions.

7. The bill should not extend the contractor listing provisions to non-violating facilities

Section 306(a) of the current Clean Air Act prohibits Federal agencies from entering into contracts with any person who is convicted of specified offenses under the Act. The prohibition is limited to the facility at which the violation occurred. Section 307 of the bill would authorize the Administrator to extend this prohibition to "other facilities owned or operated by the convicted person."

Section 306(a) already is one of the most powerful deterrents in the current Act. Extending the potential reach of this section would, as a practical matter, add little to the already significant deterrent of losing the right to receive such contracts at a violating facility. Indeed to extend the prohibition to a facility whose conduct is without fault has merely a punitive effect, because that facility's conduct would not otherwise justify such a restriction. For these reasons, we urge the Committee to delete the last sentence of proposed bill section 307 (Clean Air Act Section 306(a)).

Thank you for the opportunity to comment on the proposed legislation.

Statement of
John Archer
Managing Director, Government Affairs
American Automobile Association
to the
Subcommittee on Environmental Protection
of the
Committee on Environment and Public Works
U.S. Senate
on
S. 1490 and S. 1630
"The Clean Air Restoration Act of 1989"
October 1989

The American Automobile Association, serving almost 31 million members, appreciates this opportunity to comment on the clean air proposals now being considered by the Senate, particularly the President's proposal (S. 1490, by Senator Chafee) and S. 1630 by Senator Baucus.

AAA prefers the President's legislation, S. 1490. It would rely on tougher pollution standards, discretion in the imposition of federal sanctions, required improvements in technology and would grant the most polluted of our cities attainment deadline extensions so that the public's freedom of mobility will not be threatened.

AAA is also supportive of many aspects of Sen. Baucus' bill, S. 1630, that requires more stringent vehicle emission standards and air quality attainment deadlines. However, we question the need for several sections that would force federal funding sanctions even on cities acting in good faith, and would impose questionable restrictions and taxes on motorists in at least six major cities with chronically high pollution levels.

For background purposes, AAA's official policy guidelines with respect to automobile pollution are as follows:

1. AAA recognizes and shares the public's concern over the motor vehicle's contribution to urban air pollution and believes vehicle manufacturers should reduce harmful emissions by developing cleaner vehicles that operate efficiently under real-world driving conditions.
2. AAA recognizes the important responsibility of individuals to keep emission control systems intact and operating properly throughout the life of their vehicles by following routine maintenance steps outlined in owners' manuals.
3. AAA supports the goals of the Clean Air Act, including motor vehicle emission control programs, with the following stipulations:
 - Measurable progress in achieving cleaner air should take precedence over meeting arbitrary government compliance deadlines and standards.
 - Motor fuels offered to the public must not increase harmful vehicle emissions and must have a proper mix of protection additives that meet vehicle manufacturer specifications for all makes and models currently on the road.
 - Future emission control systems must be designed to operate effectively and must not pose a safety hazard.

Based on these fundamental concepts, AAA has the following comments concerning S. 1490 and S. 1630.

In-Use Performance: Congress should require the Environmental Protection Agency (EPA) to make improvements to its Federal Test Procedure so that future vehicles can meet current statutory emission standards in use and pass all futures state vehicle emission inspection/maintenance (I/M) programs with normal maintenance.

AAA is pleased that both bills would take steps in this direction, such as requiring vehicles to be certified at colder temperatures and establishing in-use emission standards. We favor the pertinent provisions in the Baucus bill because that legislation would:

- prohibit averaging of future emission standards;
- suspend production of a model line if more than 10 percent would fail to meet the standard.

Vehicle Restrictions: Transportation controls should not be authorized if they jeopardize the public's freedom of mobility. In many major cities, car and van pools make sense. But requirements for "carless" days, excessive bridge tolls, parking surcharges, car-free zones, and other lifestyle threatening changes are rightfully condemned by motorists. If actively pursued, such extreme measures have the potential of reducing public support for attaining clean air standards, a goal we all share.

AAA objects to Section 103 of the Baucus bill, S. 1630, which would provide the most heavily polluted cities little discretion in avoiding these questionable requirements. We also strongly object to that legislation's Sec. 188, calling for such cities to impose a so-called \$2.00 registration fee per vehicle with the proceeds to be deposited in a special trust fund for EPA's use. AAA also opposes a new tax of \$50 per parking space on major employers if they fail to achieve a 20 percent increase in vehicle occupancy rates.

We agree with President Bush's legislation that grants cities flexibility in choosing those traffic congestion and other strategies that will improve air quality while maintaining public support.

Fuel Volatility: Summertime gasoline volatility should be brought down to a Reid Vapor Pressure of 9.0 psi with proportional reductions in various geographic areas to assist states in achieving ozone attainment.

AAA believes this action is important to the success of the Act. We prefer Sen. Baucus' bill S. 1630, which would not permit refiners to average fuel volatility or to substitute necessary reductions with other proposals.

Federal Funding Sanctions: Cities making a good faith effort toward attainment should be granted more time to meet federal air quality standards without the threat of federal sanctions. Moreover, federal agencies should not dictate to states what constitutes "reasonable available" strategies.

AAA opposes a proposal in Sen. Baucus' bill, S. 1630, that would impose federal sanctions anytime a city failed to meet an emission reduction target or simply failed to achieve attainment within the bill's time frame. There's a big difference between putting teeth in a requirement and making it onerous and punitive. The sole purpose of federal sanctions should be to prod cities or states unwilling to make an effort toward reasonable further progress.

Clarification of Nonattainment Areas: Classification of areas based on the degree of carbon monoxide or ozone exceedance (moderate, serious, severe and extreme) is a step in the right direction. Both bills would create a

regulatory structure whereby the most polluted areas must achieve the most significant pollution reduction. This is a common-sense approach that the public will understand and support.

Percentage Emission Reductions: AAA endorses proposals in both bills to have cities meet a performance standard for vehicle emission reductions in specific nonattainment areas. But as we stressed above, we prefer the President's legislation (S. 1490) that would permit state and local officials discretion in devising their own programs and would not necessarily impose sanctions for failure to achieve emission reductions. This requirement -- with flexibility -- obviates the need for more specific statutory mandates for transportation control strategies.

Onboard Canisters: AAA opposes a requirement in Sen. Baucus' bill, S. 1630, for imposition of onboard refueling canisters beginning in the 1993 model year. Such a proposal would impose an added cost to many motorists who live in attainment areas.

In addition, safety concerns have been raised regarding this technology. We are pleased that EPA and the National Highway Traffic Safety Administration have signed a memorandum of understanding to coordinate their analysis of the safety implications of these devices.

"Annual" I/M Programs: We believe Senate legislation should specifically require EPA to grant discretion to states in choosing how to enhance their existing vehicle emission inspection programs. It is unwarranted and counter-productive to force states like California, Washington, Indiana, Maryland and Oregon -- which already have (or have approved) biennial inspection programs that are regarded as some of the most effective in the nation -- to change back to an annual format. Other states should be permitted to consider the biennial format or to keep annual programs if desired.

AAA endorses a proposal in the Baucus legislation requiring EPA to set a performance standard for state I/M programs. Such a standard would obligate states to meet specific emission reductions through enhancements such as Onboard Diagnostic (OBD) inspection, mandatory maintenance, anti-tampering inspections and change-of-ownership programs.

OBD inspection, for example, is considered by many in the auto repair industry as the only truly accurate way to test late-model and future vehicles for emission problems. Where needed and possible, states should take steps now to follow California's lead to convert existing, obsolete idle-mode inspections into OBD programs.

"Centralized" Inspections: In view of the many decentralized I/M programs already in existence -- and the difficulties in most states in getting those decentralized programs established -- the bill should not require centralized formats.

Alternative: We are pleased that S. 1630 requires EPA to set a performance standard for state I/M programs. This standard would obligate states to

meet specific emissions reductions through such programs as mandatory maintenance, anti-tampering inspections, change-of-ownership programs and especially, Onboard Diagnostic (OBD) inspection.

General Motors has already equipped its vehicles with self-diagnostic capabilities that will accommodate state diagnostic inspection programs with ease. Other vehicle manufacturers have followed GM's lead. With this in mind, we are pleased that both bills require EPA to issue OBD guidelines that will permit states the option of adopting an OBD format if they so choose. But we ask that they also include a requirement for standardized OBD connectors to permit diagnosis by all state I/M programs.

OBD inspection would be much more accurate than crude tailpipe inspections, and thus would identify some high-emitting vehicles without an increase in false failures during testing. It may also provide an emissions history to the inspector and therefore aid identification of faulty engine components, thus expediting necessary emissions-related recalls.

Federal Vehicle Tax: As stated above, AAA strongly opposes the section of S. 1630 requiring EPA to impose a \$2.00 per vehicle registration fee on all vehicles in severely polluted areas. We question its practicality and fairness.

The proposal would authorize the U.S. EPA to collect the tax and deposit the proceeds into a special federal trust fund. States would have little or no choice in how such proceeds would be spent. This seriously diminishes the public's input into the use of this vehicle tax.

Consumers also would be forced to pay this tax regardless of how well they maintained their vehicles. This arbitrary aspect of the proposed fee is very unfair.

Moreover, such a fee would be an encroachment upon the traditional province of states to collect their own taxes following a democratic vote by those who are to bear the tax. There would be no ability under this provision to permit a local vote on this tax, and no discussion of its justification. AAA urges that this provision be dropped.

Mobile Source Provisions: AAA supports the bulk of these sections in both bills as they relate to in-use vehicles and feels many of them are long overdue. AAA has testified before Congress and has urged EPA on numerous occasions to strengthen its vehicle certification Federal Test Procedure. The General Accounting Office has reported and the House Government Operations Committee has concluded that the FTP does not assure that in-use vehicles will perform in the same manner as when tested in the tightly controlled manner and environment used in the EPA testing facilities.

AS GAO stated in 1979, EPA requires only that the manufacturer's hand-built prototype vehicles pass its elaborate FTP. But there's no guarantee, said GAO, "that once cars are used on the road they will meet federal emissions standards."

In a later report in 1980, the Government Operations Committee concluded that "the raw reality" is that EPA tests cars only in laboratory conditions. It said "Both EPA and the car manufacturers themselves conceded" that the test "does not truly reflect on-road" performance of in-use vehicles.

More recently, the Automobile Club of Southern California issued a report that added to both the GAO and the Government Operations Committee findings. In an extensive California analysis of the emissions of thirty-one 1984 and 1985 passenger cars, the club found that -- even using EPA's much-criticized FTP -- 28 cars could not meet in-use statutory standards, some after only two years of operation. The cars the club tested had not been tampered with, had been properly maintained and were in otherwise good operating condition.

Using data compiled by a state contractor, Radian Corporation, the club estimates that because of this non-compliance problem, total hydrocarbons in the Southern California area amount to 459 tons per day, or more than twice what they should be if all vehicles were in compliance with certification standards. The existing I/M program has been able to produce a reduction of 50 tons per day -- leaving local officials with a monumental task of finding other ways to cut vehicle related HC emission by hundreds of tons per day.

AAA does not suggest that tampering or improper maintenance have not been problems. But engine design and durability from an emissions standpoint also are problems and need to be substantially improved.

We also suggest several other changes for your consideration:

-- Assemblyline Testing: The legislation should include a requirement for EPA to include both an idle emission and an Onboard Diagnostic testing regimen in the Federal Test Procedure and in its assemblyline test program. Such a requirement would ensure standardization of OBD systems in all future light-duty vehicles and would establish performance standards for such systems in all types of driving conditions. California already includes OBD testing on all vehicles in its assembly-line enforcement audit, thus demonstrating the practicality of this requirement.

-- Emission Recalls: EPA should be required to set up an emission recall program that would be triggered by the number of warranty claims that result from local I/M programs. Vehicle manufacturers should be required to share such information with EPA to enable the agency to decide whether a recall is necessary.

Such a recall program has already been established in California. The state has ordered manufacturers to inform the California Air Resources Board whenever I/M failures result in emission warranty claims representing 2 percent of a model line. This finding would then trigger a manufacturer's recall of just those vehicles with identified emission component failures.

This type of warranty-related recall would lessen the need for EPA to perform its own in-use emission recall program and would provide more current information to vehicle manufacturers about emission problems.

-- Certification Fuels: Legislation before the committee should include a requirement that EPA may not permit the sale of any motor fuel which has not been used in its FTP. This requirement would ensure that fuels such as ethanol and methanol-gasoline blends, as well as methyl or ethyl tertiary butyl ether and reformulated gasolines, are certified for emissions and fuel economy, and that future vehicles can achieve federal standards using such fuel blends. If vehicle emissions in the FTP cycle exceeded standards, then these fuel blends should not be permitted for sale.

-- Alcohol Fuels: Mandating alcohol as a gasoline blend as required in both bills will likely increase many urban ozone problems without a discernible effect on carbon monoxide. As EPA has explained, adding 10 percent ethanol to gasoline results in a blend with a higher oxygen content and an RVP up to 1.0 psi higher than the base gasoline. Such a blend might reduce exhaust emissions of CO and hydrocarbons in some vehicles, especially older, pre-1981 models. But EPA has said its tests show that such a blend would increase emissions of nitrogen oxides and would increase evaporative emissions as well. Unless there is strict enforcement of the volatility of the base gasoline used, mandating alcohol blends will lead to higher volatility gasoline leading to higher amounts of hydrocarbons and increases in ozone.

The legislation also should require EPA to promulgate regulations obligating states to enforce this volatility standard. Ten states and the District of Columbia currently have no gasoline standards whatsoever, and except for Florida, North Carolina, California and Maryland, most other states have very limited fuel inspection programs.

-- Phase-out of Leaded Gasoline: Refineries are well on the way toward phasing out leaded gas at most major brand gasoline outlets in various regions of the country. The 0.1 gram of lead in leaded gasoline currently permitted by EPA represents a 90 percent decrease from previous levels. Total lead emissions, according to EPA's latest trends report, dropped 86 percent in the 1976-1985 time period, with a 79 percent decline in ambient lead in the same period.

Despite this significant reduction in overall lead pollution in the U.S., there were still more than 20 million light-duty vehicles requiring leaded gasoline as of last year, according to EPA. This does not include millions of marine, agricultural, and other off-road vehicles still in operation and requiring leaded gasoline. More important, EPA and the Department of Agriculture reported recently that many of the additives being marketed currently as lead substitutes fail to protect vehicle engines under heavy loads.

AAA believes that until EPA approves a satisfactory lead substitute for these vehicles, the current leaded standard of 0.1 gram should be retained. The legislation therefore should ban lead only if it insures the availability of an effective lead substitute.

We would be happy to provide additional information on any of these topics.

COMMENTS OF THE AUTOMOBILE IMPORTERS OF AMERICA, INC.
ON S. 1630 SUBMITTED TO THE
ENVIRONMENTAL PROTECTION SUBCOMMITTEE
OF THE SENATE ENVIRONMENT AND PUBLIC WORKS COMMITTEE

AIA is a non-profit trade association that represents U.S. importers of passenger cars and light trucks produced outside of North America.¹ AIA supports the need for amendments that will lead to cleaner air, bring nonattainment areas into attainment, and better control toxic emissions.

We believe the time has come for Congress, industry and environmental organizations to work together to craft and pass amendments to the Clean Air Act. With the notable exception of the alternate fuels provision, we generally support S. 1490, the Administration proposal, which includes tighter tailpipe standards and other significant new controls on motor vehicles. While there are some highly meritorious features of S. 1630, many of its provisions represent an extreme position that will needlessly burden new car purchasers and is contrary to the spirit of compromise needed to reach an agreement on amendments to the Clean Air Act.

We do agree with provisions contained in both S. 1490 and S. 1630 to require control of excess evaporative emissions by control of both the fuel and the vehicle as well as provisions to mandate the installation of onboard diagnostic systems. Such systems will help diagnose failures while the vehicle is in

¹ AIA's members include: BMW of North America, Inc.; American Honda Motor Company, Inc.; Hyundai Motor America, Inc.; Isuzu Motors of America, Inc.; Jaguar Cars, Inc.; Maserati Automobiles, Inc.; Mazda Motors of America, Inc.; Mitsubishi Motor America, Inc.; Nissan Motor Corporation U.S.A.; Peugeot Motors of America, Inc.; Porsche Cars North America, Inc.; Rolls-Royce Motor Cars, Inc.; Rover Group USA, Inc.; Saab-Scania of America, Inc.; Subaru of America, Inc.; American Suzuki Motor Corporation; Toyota Motor Sales U.S.A., Inc.; Volkswagen of America, Inc.; and Volvo North America Corporation.

operation and eventually can lead to elimination of, or changes to, the current I/M test procedure which is less sophisticated at identifying problems.

However, these systems are just now being developed and EPA must have discretion and flexibility in setting applicable model years for each component to be diagnosed. Because the technology is still not mature, premature introduction could lead to false failure indications resulting in poor consumer acceptance of what should become a very important control system.

We commend the committee for not incorporating alternative fuel requirements in this bill. While continuing research and demonstration programs to enhance understanding of alternative fuels is appropriate, it would be premature to mandate large numbers of vehicles to operate on these fuels given the many questions that remain unanswered. These include issues on the health and safety of these fuels as well as pricing, driving range, consumer acceptance and many others.

We do have strong views on the excessive stringency of S. 1630, however. It would impose tailpipe standards tighter than S. 1490 and then halve these levels again at the end of the next decade. There is no technological basis nor any shred of analytical data to suggest that these second tier standards are within the range of feasibility. Even the California Air Resources Board (CARB) in testimony before this Committee indicated that such standards were not needed in the State with the most severe air quality problems in the nation.

In addition, the bill would increase the useful life of motor vehicles to 10 years and 100,000 miles, effectively doubling the stringency of the new, tighter standards. S. 1630 also ignores the need for the phase-in of new standards that has been recognized in S. 1490, HR 99, and by the State of

California. A phase-in is critical if manufacturers are to avoid severe cost and driveability penalties that can occur with across the board changes in one model year. This is especially important for small-volume manufacturers.

Control of refueling emissions would be mandated via onboard control systems in spite of the fact that S. 1630 also requires Stage II refueling controls in nonattainment areas. Requiring both control systems is redundant, simply not cost-effective, and may even be counterproductive, as evidenced by a recent study in California. Stage II is a superior strategy; it will result in the control of refueling emissions from all vehicles on the road, both new and old, immediately upon installation. At least 15 years will elapse before onboard controls would become fully effective when development, leadtime and fleet turnover are considered, assuming safety concerns can be adequately addressed.

Moreover, a Congressional mandate for onboard controls would place the Congress at odds with the National Highway Traffic Safety Administration (NHTSA) and the National Transportation Safety Board (NTSB). Both agencies with special expertise in, and the mandate for, transportation safety have opposed the imposition of onboard refueling controls.

In S. 1630, light-duty trucks weighing less than 3,750 pounds (loaded vehicle weight) would be required to meet the same standards as passenger cars. This represents an even greater tightening of standards from current levels than what is required for passenger cars and ignores the functional aspects of truck design. Regardless of some consumer use of trucks as passenger carrying vehicles, manufacturers must still engineer them to fulfill design specifications for load carrying functions.

One of the most onerous provisions in S. 1630 is the proposed requirements relating to carbon dioxide to address global warming. The CO₂ standards represent a de facto fuel economy standard of great stringency. The only way to meet such standards for most companies would be to significantly downsize vehicles. This distortion of the marketplace would clearly not be acceptable to the public, given current market conditions. For companies which sell in a select market niche, these standards could simply prohibit them from marketing their cars in the United States, further narrowing consumer choice.

Moreover, the requirements are not well defined. There is no guidance provided to the Agency on how to implement an average tailpipe emission requirement. Nor, is there any clue as to how warranty and recall programs are to apply to the specified average car standards.

For these and other reasons, global warming should be addressed in a separate forum at a different time. In recognition of its world-wide scope, a conference under the auspices of the United Nations is needed to respond to this problem, a step we strongly support. Incorporation of global warming and fuel economy issues in clean air legislation will only exacerbate what is already a complex and difficult legislative process.

In summary, we believe that S. 1630 would set motor vehicle standards that are simply unattainable and which will polarize the debate on clean air legislation. We urge the Senate Environment Committee to use S. 1490 as the mark-up vehicle for clean air legislation in this session.

BEFORE THE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

STATEMENT REGARDING S. 1630
BY
TRANSPORTATION SYSTEMS BUSINESS OPERATIONS
GENERAL ELECTRIC COMPANY

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October 23, 1989

Comments Relating to Proposed Legislation
Affecting Diesel Engine Powered Locomotives

GE Transportation Systems

October 23, 1989

General Electric Company's Transportation Systems Business, located in Erie, Pennsylvania, is one of the leading manufacturers of diesel electric locomotives in the world and has approximately 50% of the United States market. General Electric supports the need to protect the Nation's environment and wishes to ensure that any emission regulations which may be implemented do lead to a reduction in total emissions. We believe that any legislative action should be undertaken in light of the following points:

Railroads should be viewed as a proportionately low emission, highly productive and fuel efficient transportation mode. According to EPA National Air Pollutant Emission Estimates 1940-1985, of the emissions from all sources, railroads account for only .6% of the volatile organic compounds, .3% of CO, 2.7% of NOx, .5% of particulates, and .4% of the sulfur dioxides. These are low values and most do not occur in urban areas where the greatest concentrations of pollutants are located. Further, locomotives produce three to four times the work (revenue ton-miles) per horsepower as the work produced by long haul on-highway trucks and consume approximately 1/3 as much fuel per unit work done (1986 data).

Locomotives are decreasing further as an emissions contributor as the number in use declines and railroad energy efficiency improves. Since 1977, the locomotive fleet has declined about 20% to a total fleet of approximately 20,000 locomotives today. Retiring old, low efficiency units, improving fuel efficiency (new GE locomotives today are typically 20% better than new units of 15 years ago), shutting down units instead of idling, reducing switching activity and increasing through trains all have had a significant favorable impact on emissions.

Large bore medium speed locomotive diesel engines are different from on-highway diesel engines, therefore, on-highway emission reduction technology may not transfer directly. On-highway engines are small (several hundred horsepower) compared to modern locomotive engines which are typically 3000 to 4000 horsepower. On-highway truck emissions are based on a transient test procedure that is representative of on-highway truck duty. Locomotive engines are powerplants that operate at discrete load and speed points ("notches"). The diesel engine drives an alternator which then supplies electrical power to the traction electric motors which drive the locomotive wheels. When the amount of power called for changes, the diesel engine operates at a higher or lower steady state load and speed. The steady state nature of the duty cycle allows for optimization of fuel efficiency. This tends to minimize CO, HC and particulates and on modern four - stroke engines these values are quite low. Concerning NOx, it may be fundamentally more difficult for locomotive large bore medium speed engines to achieve the same low values as the smaller truck size diesels because locomotive engines operate at much higher rated horsepower per volume displacement than truck engines and are designed to run at very high peak firing pressures for fuel efficiency and power output (on a railroad duty cycle up to 75% of fuel is consumed at full rated horsepower). Modern high horsepower locomotive engines are highly turbocharged and run at high boost pressures; therefore, the intercooling requirements are proportionately greater than for trucks. Thus to reduce manifold temperatures, as a means of reducing NOx, larger radiators are required. This presents a severe packaging problem on locomotives which are already constrained in size and weight by track loading capability, turning requirements, and clearances through tunnels and bridges. Feasible, cost effective technology necessary to make the sort of dramatic reductions already required for on-highway diesels has not been developed for locomotive engines.

Work is underway to improve the limited information available relating to locomotive diesel engine emission reduction technology but more study and development is required. Many years of research and development have resulted in significant advances in emission control technology for on-highway diesel engines. Relatively little development or testing has been done to date on emission technologies specifically for

medium-speed locomotive size engines. Little testing of locomotive engines has been done to demonstrate use of "on-highway" reduction techniques and their performance and economic impact is not well known. Projects sponsored by the State of California, the Association of American Railroads (AAR), and the locomotive manufacturers are currently underway aimed at establishing accurate data on present day locomotive diesel engine emissions and assessing present and forecast technology which may be utilized to reduce emissions. Presently available technology which may be applied to locomotive diesel engines includes retarded timing, increased injection pressures, a separate circuit water cooling system to reduce the temperature of incoming air for combustion, and optimization of combustion chamber, air flow, and locomotive notch settings. None of these technologies are "off the shelf" or "bolt on" items and each requires extensive development and testing for specific engines.

Until recently, emission data has not been routinely measured on General Electric's locomotive diesels. Below is shown limited data on a GE 7FDL engine operating at steady state full rated horsepower:

HEAVY DUTY TRUCK & BUS STANDARDS	Grams / hp-hr (Transient Duty Cycle)			
	NO _x	CO	HC	PM (Particulate)
1985.	10.7	15.5	1.3	--- (Not Regulated)
1988	10.7	15.5	1.3	0.60
1990	6.0	15.5	1.3	0.60
1991	5.0	15.5	1.3	0.25 (0.1 for Buses)
1994	5.0	15.5	1.3	0.10
GE ENGINE (Steady State & Rated Full Horsepower)	11.6	0.8	0.2	0.20

General Electric is committing significant engineering resources to emissions research. General Electric believes that it is important to establish an accurate body of information relating specifically to its engines. Present programs are aimed at improving emission measurement techniques, establishing a large sample of emissions data as a baseline for future work, and studying effects of reducing manifold temperatures and retarding injection

timing. This work includes testing in GE's own laboratories, testing of an engine at our consultant's facility, and support of AAR sponsored testing of a GE engine. Work in 1990 will include testing of injection system designs and investigations of combustion chamber geometry.

General Electric's present assessment of current technology indicates that alternative fuels such as methanol or natural gas may be required to meet proposed future emission standards. The costs of owning and operating locomotives operating on alternate fuels will clearly be high. More locomotives will be required because peak power output will be significantly reduced and reliability may be lower. Additional fueling facilities will be required in parallel to existing diesel fuel related facilities. Because of their lower energy content per volume (methanol = 56,500 BTU / Gallon; liquified natural gas = 73,500 BTU / Gallon, compressed natural gas @ 3000 psi = 29,000 BTU / Gallon, versus diesel oil = 135,000 BTU / Gallon), large quantities of alternative fuels will need to be transported in locomotive fuel tanks plus trailing fuel tenders. Regulation which mandates (either directly or indirectly by setting emission levels not achievable with diesel fuels) alternate fuels such as methanol or natural gas should be avoided until safety, logistical, operational and cost consequences are well understood for locomotive size diesel engines.

Costs to the locomotive builders to develop emission reduction technologies will be similar to those incurred for on highway vehicle engines but must be recovered over much smaller annual unit volumes. Although data regarding on-highway industry spending for emissions is not reported, one source has estimated that the on-highway truck and bus engine industry (\$3 to 4 Billion per year revenue) is currently spending \$50 Million per year in research alone to meet 1991/1994 standards. The North American locomotive engine industry revenue by contrast is about \$0.3 Billion per year. Regulation requiring use of very expensive technology (and / or alternative fuels) could result in prohibitively high prices for new locomotives and delay their introduction into the fleet. Thus excessive regulation could adversely impact emissions compared to encouraging acquisition of new present technology (more reliable, productive, fuel efficient) units.

In summary, General Electric is committed to improving the understanding of emission reduction technologies for medium speed diesel engines as applied to locomotives and believes that the understanding of locomotive emissions is not adequate to permit establishment of regulations at this time. Programs are currently underway to improve understanding of reduction technologies but because of the low quantities of engines produced and their proportionately low emissions, little development has been done to date. Because of the locomotives' different mode of operation (steady state) vs trucks (transient) and their higher efficiency design requirements, on-highway emission technology may not transfer directly. Further, cost consequences of various emission reduction technologies and their impact on railroad share versus trucks are not understood at this time. Locomotives should be considered as a highly fuel and emission efficient mode of transportation producing three to four times the work (revenue ton miles) per horsepower as on-highway trucks.

General Electric recommends that any legislation, if required at this time, include:

- Prohibition of regulation by individual States of locomotive emissions. Railroads by their nature are primarily long haul, interstate operations. It is operationally impractical to have different locomotives for different states.
- Reasonable provisions that, instead of establishing fixed standards, would allow the EPA to make an informed judgement and promulgate economically feasible standards where and when required.
- Provision of sufficient time for thorough study by the EPA of the need for regulation of locomotives. Need for regulation must be based on comparison of emissions per unit work provided (grams of emissions per revenue ton mile) versus other transportation modes.
- Such study must include assessment of the effect on costs of various levels of locomotive emission reduction techniques and their resulting impact on transportation modal shifts.

Statement of Honda North America, Inc.
for the Subcommittee on Environmental Protection
of the Senate Environment and Public Works Committee
on S. 1630, Clean Air Restoration and
Standards Attainment Act of 1989

October 19, 1989

Honda appreciates the opportunity to comment on S. 1630, the Clean Air Act amendments. We recognize the national need to further clean up the air and accept our responsibility to contribute to it. Our comments will address both the mobile source and stationary source provisions of the bill.

MOBILE SOURCE

Honda is proud of its past progress in reducing emissions from our automobiles. Today's new car emits 96 percent less carbon monoxide (CO) and hydrocarbons (HC) and 76 percent less nitrogen oxides (NOx) compared to uncontrolled vehicles. It should also be noted that at the same time that exhaust and evaporative emissions have been greatly reduced, manufacturers have also met additional requirements for safety and fuel efficiency. According to OTA, as older vehicles are gradually replaced with newer, cleaner ones, VOC emissions from highway vehicles will decline by 25 percent between 1985 and 1999.

S. 1630 imposes unreasonable burdens on the reduction of air pollution from mobile sources. We do not believe that such drastic reductions from today's levels are possible with the currently available technologies.

Section 201: Emissions Standards

This section establishes tighter tailpipe emissions standards for gasoline fueled automobiles beginning in model year (MY) 1993. A new nonmethane hydrocarbon (NMHC) standard is proposed at 0.25 gpm, with the total hydrocarbon standard tightened from 0.41 gpm to 0.31 gpm, and the NOx standard reduced from 1.0 gpm to 0.4 gpm. A second tier of standards would take effect beginning in MY 2003: 0.125 gpm HC; 0.2 gpm NOx and 1.7 gpm CO.

We do not believe that the first tier of standards contained in S. 1630 is either necessary or cost effective since it imposes California type standards nationwide where the unique California air pollution conditions do not exist. Such standards will result in increased costs for consumers and quite possibly be accompanied with degraded fuel economy.

Furthermore, requiring such stringent standards in 1993 for our entire model line for both certification and in-use is not realistic. The California Air Resources Board recognized this and adopted a phase-in as well as separate certification and in-use standards. This will permit vehicle manufacturers to produce some vehicles equipped with new and improved technologies while accepting certain risks due to incomplete confirmation of vehicle deterioration under a broad enough range of operating conditions. It has the merit of providing information feed-back from actual in-use vehicles on the emission control system's performance which can be applied to new vehicles under development which must meet the certification standards in use.

We also strongly suggest that the Subcommittee consider the inclusion of a less stringent in-use emission standard in order to allow for deterioration of the emission control system which is often caused by factors beyond the manufacturer's control. These factors include fuel and oil quality, customer maintenance and unusual vehicle operating conditions.

The second tier of tailpipe emission standards in S. 1630 proposed for model year 2003 is not technologically feasible. They appear to be based on an arbitrary halving of the 1993 standards. These stringent standards would force manufacturers to target a zero level of tailpipe emissions at certification in order to account for the deterioration of the emissions of in-use vehicles. We have no technology in either the concept or development stage which could achieve that level.

Section 202: Cold CO Standard

This section sets a new cold CO standard beginning in MY 1993 at 10 gpm for light duty vehicles when tested at 20° F and declining to 3.4 gpm in the year 2000. A phase-in of the standard as proposed to the EPA by MVMA and AIA is needed to ease the development, cost and testing burdens. The second tier cold CO standard is not supported by the current level of technology.

Section 203: Control of Vehicle Refueling Emissions

This section requires EPA to promulgate regulations requiring the installation of onboard systems for the control of fuel vapor during refueling beginning in MY 1993 and requires a minimum capture rate of 75 percent. There are several significant problems to be resolved before the installation of the onboard vapor recovery system currently proposed by EPA should be even considered. As the Department of Transportation has pointed out, the primary and secondary damage which occurs during the vehicle crash test may rupture the canister and fuel pipes. Questions regarding the protection of pipe and tube fittings and the emergency relief of vapor pressure in the fuel tank must be resolved before proceeding further with this proposal.

An important reason for not requiring onboard vapor recovery is its poor cost/benefit ratio compared to Stage II controls which have been adopted by several states. Further, even if onboard storage were adopted it would take many years before it becomes as effective as Stage II will be from the start. To require both onboard storage and Stage II controls is redundant and the effectiveness of Stage II has already been established. Therefore, we urge the Subcommittee to delete this provision.

Section 204: Evaporative Emissions

EPA is required to promulgate regulations under this section to reduce the evaporative emissions of hydrocarbon, including running losses, from gasoline-fueled motor vehicles. Beginning in MY 1994, these regulations must require the greatest degree of reduction achievable by means expected to be available during any model year to which such regulations apply.

The leadtime is insufficient considering that the standards and test procedure would not be set for 18 months. Also, the provision appears to grant EPA the authority to change the standard each year requiring manufacturers to meet a moving target which will be inefficient and costly. A minimum two years leadtime must be allowed and a phased-in effective date schedule should be considered.

Section 205: Onboard Emission Diagnostic Systems

This provision requires EPA to promulgate within 18 months regulations to provide for the installation of onboard diagnostic systems beginning in MY 1994. As with other provisions of S. 1630, this provision suffers from EPA having no discretion in setting the standard or deciding on its content, and allows neither enough leadtime nor a phase-in.

The concept of OBD can provide benefits by early detection of failures and by causing the public to bring their car in for repair if a failure of an emissions-related part is detected. While the California Air Resources Board has in place a requirement for onboard diagnostic systems with a more sophisticated (OBD II) system planned for the mid-1990s with a phase-in, the feasibility of certain requirements and the effective dates are not resolved yet. Recently, CARB directed its staff to continue monitoring research and development activities related to OBD for two years and to report on manufacturers' progress in developing the new technology. We recommend that EPA be allowed to proceed with this issue through their normal rulemaking activity and monitor CARB's progress in lieu of legislative action.

Section 206: Carbon Dioxide Emissions

Section 206 requires EPA to set a new passenger automobile emissions standard for carbon dioxide (CO₂). Between MY's 1995 and 2002, each manufacturer's average CO₂ emission must not exceed 242 gpm, and beginning in MY 2003 must not exceed 170 gpm. These standards are estimated to roughly equate to city fuel economy standards of 35 mpg and 50 mpg. Unlike the current CAFE standards, vehicle manufacturers would be subject to in-use recall for non compliance over the full useful life of the vehicle.

Honda agrees that CO2 is an important global environmental concern. The reduction of CO2 emissions from motor vehicles should be part of a comprehensive and cross-disciplinary global strategy. Reducing CO2 emissions from U.S. vehicles in isolation will do little to halt the buildup of worldwide greenhouse gases since they account for only 2.5 percent of the problem. The most important contribution from motor vehicles in this area of concern is the replacement of CFCs. Honda plans to begin the phase-out of CFC's as soon as the toxicology tests being run on the potential substitute are complete.

A CO2 standard does not seem appropriate for inclusion in S. 1630, which deals with health related air quality issues. It's inclusion amounts to a back-door setting of energy policy. We urge the Subcommittee to delete this provision. The subject of automotive fuel economy is already being considered in the Commerce Committee.

Section 207: Low Polluting Vehicles

This section defines low polluting vehicles and requires EPA to set specific standards for the emission of carbon monoxide, formaldehyde, hydrocarbons, oxides of nitrogen, carbon dioxide and any other air pollutants associated with such vehicles which are a potential threat

to public health or welfare. We agree with the approach of S. 1630 of allowing manufacturers to voluntarily introduce alternative fueled cars following a demonstration program which can provide feedback on both technical problems and consumer acceptability.

Section 208: Useful Life

S. 1630 extends the useful life for the certification and recall of light duty vehicles from 5 years/50,000 miles to 10 years/100,000 miles beginning in MY 1995. The extension of the useful life effectively doubles the stringency of the proposed emissions standards. It requires manufacturers to target certification levels well below what they would have to allow for a 5 year/50,000 mile useful life due to the normal deterioration these systems experience over time. If a 10 year/100,000 mile useful life is adopted, then we strongly urge that separate in-use standards be included as was done by California.

Section 212: Testing and Certification

This section establishes several new motor vehicle testing and certification requirements. A new idle test is created as part of the Federal Test Procedure. The requirement is unrelated to air quality and will result in increased testing expenses with no measurable benefit since failure of a state test is covered under warranty.

The maximum allowed failing percentage of vehicles for production line testing is also reduced from 40 percent to 10 percent beginning in MY 1991. Several other proposed changes contained in this section together with this change greatly increase the difficulty of meeting the emissions standards.

With regard to Section 212(c), Honda does not oppose EPA's periodic reviews of the Federal test procedure's correlation to actual driving conditions. However, we believe the cost and practicality of changes in the procedures should be closely considered by EPA since changes in the test procedure can affect measured fuel economy and compliance with CAFE standards.

Section 212(d) prohibits averaging by requiring that each emission standard be met by each and every vehicle or engine. While we understand the Subcommittee's concern over allowing averaging to be applied too broadly, averaging within engine families is current practice in certain product categories and should be continued.

Section 213: In-Use Compliance Recall

This provision requires EPA to take State vehicle inspection and maintenance information into account in determining in-use nonconformity. We believe that recalls should not be based on data which does not distinguish vehicles which have not been properly maintained, have been illegally impaired due to tampering, or are beyond the useful life. Most State I&M programs do not include this data. Prior to triggering a recall, we believe that the information should be made available to the manufacturer and an opportunity for review provided.

Section 213(b) requires the manufacturer to pay the cost of EPA's compliance tests. We object to this approach because there are no limits and testing may be done arbitrarily.

Section 214: Fuel Volatility

The reduction of fuel volatility would remove much excess hydrocarbon emission from evaporative losses and running losses. We support the RVP control proposed in the bill.

Section 217: Fuel Quality

This section requires EPA to promulgate specifications for fuel quality which will minimize emissions of hydrocarbons, carbon monoxide, oxides of nitrogen, particulate matter and hazardous air pollutants over the useful life of the vehicles. We believe a reasonable control of fuel specification may further contribute to the reduction of air pollution. However, care must be taken to prevent unreasonable degradation of other important vehicle characteristics, such as the ability of the engine to start under low temperature conditions, in order to avoid consumer dissatisfaction.

Section 218: Oxygenated Fuels

S. 1630 requires that, beginning in MY 1991, the oxygen content of any gasoline fuel sold in a CO nonattainment area between October and March of every year must be at least 3.1 percent. At present, only ethanol could meet this requirement. Honda would support a reduction in the oxygen content to make the bill fuel neutral.

We strongly urge the Subcommittee to re-evaluate some of the control measures in S. 1630 from the standpoint of technological feasibility and economic impact before any action is taken. We would welcome the opportunity to work with you or your staff in developing more acceptable mobile source provisions.

STATIONARY SOURCE

Honda of America Mfg., Inc. ("Honda of America"), an affiliate of Honda North America, Inc., is the fourth largest automobile manufacturer in the U.S. In 1988, Honda was the number one U.S. exporter of automobiles to Japan. In 1991, Honda of America's total investment in the U.S. will be more than \$2 billion and approximately 9,000 associates will be employed at the Marysville, Ohio Motorcycle and Auto Plants, the Anna, Ohio Engine Plant and the East Liberty, Ohio Auto Plant (now under construction).

Honda of America began operations in the United States in 1979 with production of motorcycles at the 260,000 square foot Marysville Motorcycle Plant. Automobile production began at the new 3.1 million square foot Marysville Auto Plant in 1982 and production of engines and related components began at the now 1 million square foot Anna Engine Plant in 1985. The 1.4 million square foot East Liberty Auto Plant is scheduled to begin production of automobiles this fall.

As a young U.S. motor vehicle manufacturer, we are concerned about certain provisions in S.1630, the Clean Air Restoration and Standards Attainment Act of 1989, which may negatively impact our growth and development activities and result in unnecessary regulatory burdens.

Emissions Inventory

S. 1630 appears to rely on an arbitrarily chosen base year of actual emissions for determining offsets, Volatile Organic Compounds targets and new source modifications. For growing companies with new facilities, emissions tend to be lower and often below allowable permit levels in the early years of operation. If emission levels are set by a base year in the early years of operation, a company may have to seek offsets to cover emissions which were allowable under a properly obtained environmental permit. Further, it appears possible that a company with a facility under construction and, thus, without any established emissions level, may be required to obtain additional offsets because this facility had no actual emissions in the chosen base year.

High Offset Ratios

We are concerned about the offset ratios established at a 2 to 1 level for ozone nonattainment areas classified as severe in S.1630. This particular provision may unnecessarily inhibit industrial growth and facilities modernization, which could result in the application of improved emissions technology and, ultimately, reduced emissions levels.

Source Definition

S.1630 changes the definition of a "source" resulting in the elimination of netting and trading. The practice of netting and trading allows manufacturers some flexibility in meeting the competitive demands of the marketplace by adjusting emissions levels at production facilities to meet business needs without raising overall emissions levels in the particular area where these facilities are located.

New Source Review Thresholds

We understand that S.1630 reduces New Source Review Thresholds for ozone nonattainment areas classified as severe and extreme to 25 tons and 10 tons, respectively. This requirement will likely result in a significant additional regulatory burden which may cause manufacturers to devote an inordinate and unnecessary amount of time and effort to processes that yield insignificant emissions reduction benefits.

Excessive Emissions Fees

Based upon the fee structure and requirements outlined in S.1630, some industries may be required to pay annual emissions fees in excess of \$25 million per year. This is excessive and counter productive in nature, draining much needed finances which industry could direct toward modernization of efforts to reduce emissions.

Expansion of Ozone Nonattainment Areas

Expanding the definition of ozone nonattainment areas to cover an entire Metropolitan Statistical Area plus a radius of 25 miles (in an attempt to incorporate all emissions sources in a wide area) places an unnecessary regulatory burden on areas which are now considered ozone attainment areas. It would be more appropriate in our view to determine each ozone nonattainment area on a case by case basis taking into account the situation in particular areas. By establishing a unique class for the Los Angeles, California area, S.1630 already moves in this direction.

Ozone Level Determinations

Unlike H.R. 3030, now under consideration in the U.S. House of Representatives, S.1630 does not define a specified, uniform method for establishing or determining the ozone level in a particular area. The absence of any such provision may create confusion and result in potential misunderstanding of future ozone requirements or wide variation of ozone requirements nationwide.

Like many other manufacturers which would be affected by the provisions in S.1630, Honda of America is committed to employing technology and methods aimed at reducing emissions to the greatest extent possible. With this in mind, some legislative modification of S.1630, taking into account the concerns identified in this communication, may be necessary as the legislative process develops.

We appreciate your consideration of our views and concerns.



Testimony of J. Daniel Khazzoom
Ozone, Global Warming and Automobile
Fuel Efficiency

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Hearings on Senate Bill 1630, Clean Air Restoration and Standards
Attainment Act of 1989
Senate Committee on Environment and Public Works

With the increased concern about automobile emissions and global warming, there has been increased interest in strengthening the existing standards of automobile fuel economy. Advocates of increased fuel economy make the point that the reduction in the fuel burnt (brought about by the increased fuel-efficiency), will result in a reduction in pollution and (by reducing the emission of CO₂) will also bring about an improvement in global warming. Some point out also that, in addition to its beneficial environmental impact, increased fuel economy contributes to a reduction in oil imports and enhances our national security. (See for example, Ralph Nader, New York Times 9/11/88).

This testimony points to a serious misconception about the nature of EPA's policy and the adverse effect this policy has on the ability of increased fuel economy (and, in general, any energy conservation measure) to reduce vehicle emission.

My main point is this: because of the way in which the EPA implements its policy of pollution control in the transportation sector, increased fuel economy will lead to more (not less) emissions of hydrocarbons, oxides of nitrogen, and carbon

monoxide--the first two are well known precursors of ozone. The logic of this statement, appears to be counterintuitive at first. But, let us examine how EPA sets emission standards for cars, and then explain the mechanics of how EPA's policy leads to this counterintuitive result.

How EPA Sets Emission Standards

Under the current regime, EPA implements its policy of pollution control in the transportation sector by specifying the amount of exhaust emission permitted per mile driven (rather than per gallon of fuel burnt). On the face of it, the policy looks reasonable. But its practical effect is not so benign, because it severs the relationship that we would logically expect to exist between pollution and the source of pollution--namely, the gasoline burnt. Under the current EPA policy, the only way emissions will come down is if the number of miles driven comes down. It no longer matters under the current policy how much or how little gasoline is burnt. If the vehicle miles traveled (VMT) does not come down, pollution will not come down either. What happens to fuel economy or to the amount of fuel burnt has been made irrelevant under EPA's current policy.

Unfortunately, the number of miles driven does not come down but goes up when automobiles become more fuel efficient. When the car is made more fuel efficient, it becomes less costly to drive. As a result, people tend to drive more, and with increased VMT, the pollution increases. This occurs in the face of a decrease in the usage of gasoline made possible by the increased fuel efficiency.

To see concretely how this happens, take an illustrative

example.

How Does it Work

Assume that new cars are now produced to yield 27.5 miles per gallon, and consider a person who owns a new 27.5 MPG car. She drives it 1000 miles a month. For simplicity's sake, suppose that EPA's allowed emission rate is 1 gram per mile, so that the car now emits 1000 grams of the pollutant per month. Suppose now the CAFE standards are strengthened. To make the arithmetic simple, let us say the cars are now required to be twice as efficient. Consider what happens if our car owner were to buy the 55-MPG car. If she continues to drive 1000 miles as before, her consumption of gasoline will be cut by 50%. But by the same token, because she is driving 1000 miles, her 55-MPG car will emit 1000 grams of the pollutant per month (as the 27.5 MPG would have done). In other words, no reduction in emission is achieved even though the car is now twice as efficient. Many people make the mistake of assuming that because the car is more efficient, its emission rate is now lower. It is not. In both cases, prior to tightening the CAFE and after tightening the CAFE, the producer has been required by EPA to meet the same standard of 1 gram of pollutant per mile. There is nothing in EPA's regulation that says that since the car burns now half as much fuel per mile, its emission per mile should also be cut to a half. On his part, the producer gets no brownie points for reducing the emissions below what EPA's standards require. The new 55-MPG car will be produced emitting the same number of grams per mile as its 27.5 MPG predecessor. Hence, while a strengthened CAFE succeeds in cutting gasoline consumption to a half of what it

used to be, the total emission will remain at 1000 grams as before.

Actually the situation is even worse.

As I mentioned above, with the more fuel efficient car, the marginal cost of driving is lowered. Roughly speaking, one can now drive two miles for the price of one. This leads to an upward pressure on travel. The impact of the lower cost of driving on miles traveled is well documented. Evidence indicates that even in the short run, this impact is substantial--approximately 30% of the efficiency gain is lost through increased travel. For an empirical evidence on this point, see Roger D. Blair, David Kaserman and Richard C. Tepel, "The Impact of Improved Mileage on Gasoline Consumption," Economic Inquiry (April, 1984) pp. 209-217; John W. Mayo and John E. Mathis, "The Effectiveness of Mandatory Fuel Efficiency Standards in Reducing the Demand for Gasoline," Applied Economics (February, 1988), pp. 1-9.

What will happen to gasoline use now? Because our car owner is now driving, say, thirty percent more than before, the amount of fuel burnt will decline by only 35% (instead of 50%). But the car is now emitting 1300 grams of the pollutant per month, instead of the previous 1000 grams. In short, fuel burnt has dropped by 35%, but pollution has increased from 1000 grams to 1300 grams. This result conflicts with one's basic intuition, as one tends to think that burning less fuel should result in less, not more, pollution.

This would not have happened had EPA's policy been to set standards in terms of grams per gallon of fuel burnt, or

alternatively to adjust its grams-per-mile standards in tandem with increased fuel efficiency. Gasoline consumption would have dropped, and so would have the pollution. For a place like Los Angeles this would have brought relief, in spite of the fact that people would have increased their travel in the meantime.

The Effect of EPA's Policy on the Efficacy of Other Conservation Measures

The perverse result just described inhibits all other conservation measures, not just increased fuel economy, whenever any conservation measure (be it government-mandated or price-induced, such as gas guzzler tax, gasoline tax, etc.) is used as a tool for lowering auto emission. In a recent study sponsored by the Congressional Research Service under the auspices of the House Subcommittee on Energy and Power, (see Congressional Research Service, "Quantification of the Impact of Gasoline Tax on Auto Emissions," December 1988) I found that the long-run reduction in exhaust emission achievable under a grams-per-gallon standard is seven to eight times as large as the reduction in emission currently achievable under EPA's grams-per-mile standard. My results are summarized in Table 1 for various increases in gasoline price brought about by the gasoline tax.

Table 1: Ratio of the Reduction in Exhaust Emissions Under a Grams-per-Gallon Standard to the Reduction in Emissions Under a Grams-per-Mile Standard (Deterministic Case).

Gasoline Tax Raises Gasoline Price by	Ratio	
	Short Run	Long Run
10%	1.6	8.1
20%	1.6	7.9
30%	1.6	7.7
50%	1.6	7.4
100%	1.4	6.7

Evaporative Emission:

The exact same difficulties plague. EPA's regulation of evaporative emission, except that the evaporative standards are expressed in terms of grams per trip, rather than grams-per-mile. The difficulties that result from the decoupling of emission from the source of emission occur here, as well. We encounter the same counterintuitive result: an increase in fuel economy leads to an increase, rather than a decrease in evaporative emissions. This is so because the increased travel stimulated by the reduction in the marginal cost of travel will be reflected not only in an increase in VMT but in the number of trips taken as well.

Global Warming

Looking a little further down the road, the issue of how to deal with global warming is likely to highlight the problem of interaction of fuel efficiency standards, energy conservation and environmental quality. As the international community attempts to deal with the phenomenon of global warming, it is likely that the more efficient use of energy to reduce carbon dioxide

emissions will become increasingly a high worldwide priority. What will be the impact of strengthened fuel economy standards? First, gasoline usage will decrease. Since less gasoline will be used and produced, carbon dioxide emissions will be reduced, thus lessening global warming. On the other hand, the additional ozone created by the increased emission of hydrocarbons and oxides of nitrogen will offset the beneficial effect of the reduction in carbon dioxide on the environment, since ozone itself is a warming agent. Again, this would not happen if EPA's policy of emission control were implemented in terms that tie the emission to the amount of fuel burnt, rather than to miles traveled or trips taken. Then all pollutants would decrease, as gasoline consumption decreases.

Conclusion

If the committee opts for requiring an increase in the level of fuel economy, as S1630 proposes, an examination of EPA's current policy of setting standards is essential. The committee ought to give a serious thought to the need for altering current EPA's policy of emission standards. The two goals of energy conservation and emission control should not have to be at loggerheads with each other. If EPA's policy is altered either by switching to a grams-per-gallon policy or by adjusting the grams-per-mile and grams-per-trip standards in tandem with increased fuel efficiency, society will be able to derive the benefit of environmental improvement that increased fuel economy potentially offers, but that presently society cannot enjoy.

October 13, 1989

STATEMENT OF THE NATIONAL COTTON COUNCIL OF AMERICA
AND THE NATIONAL COTTON GINNERS' ASSOCIATION
ON PROPOSED CLEAN AIR LEGISLATION
SUBMITTED TO THE SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION,
SENATE ENVIRONMENT AND PUBLIC WORKS COMMITTEE

The National Cotton Council of America (NCC), with headquarters in Memphis, TN is the central organization of the American cotton industry, representing producers, ginner, seed crushers, merchants, warehousemen, cooperatives, and manufacturers in the 19 cotton-producing states. The National Cotton Ginner's Association (NCGA) represents seventeen state and regional ginner organizations across the Cotton Belt. NCC and NCGA understand the need for and support the goal of protecting human health by further reduction in air pollution.

These comments address some of the concerns of NCC and NCGA with the clean air legislation (S.816, S.1630, S.1490) as presently written.

The cotton industry includes a variety of industries:

1. Cotton producers grow the crop using pesticides and other agricultural chemicals which can be a small source of VOC's and other chemicals listed in S.816. Fields are plowed, cultivated, and harvested, all of which create fugitive dust.
2. Cotton gins remove the cotton fiber from the seed. This fixed site agricultural operation can release particulate matter (PM-10) and fugitive dust into the environment during the two to three months that they are in operation.
3. Cottonseed oil mills extract the healthful vegetable oil, cottonseed oil, from the seed. Seed meats and hulls are also

produced from the cottonseed, which are used for animal feed; as well as linters (short fuzz fiber that remains on the fiber after ginning), which are used as batting in the mattress and furniture industry and in the chemical (as a source of cellulose) and paper industries. Hexane, a chemical listed in S.816, is used to extract the oil. Fugitive releases of hexane and dust and releases of particulate matter (PM-10) can occur during the 6 to 12 months that oil mills operate.

4. Textile manufacturers process the cotton fiber into yarn and weave or knit the yarn into fabric. These operations use relatively small amounts of water and chemicals (e.g., starch and polyvinyl alcohol as sizes). Fabrics are dyed and finished and these are the operations where significant chemical usage occurs. These chemicals are essential to produce textiles that are durable with acceptable quality and appearance. Emissions from the textile industry are mostly fugitive.

Some MCC Concerns

Air Toxics: The Environmental Protection Agency (EPA), not Congress, should be charged with determining the appropriate chemicals subject to regulatory control. Instead of the proposed list in S.816, EPA should be given authority to develop, through rulemaking, the list of chemicals for regulation. EPA would be able to determine those chemicals which have the greatest potential for causing health problems and be able to control those chemicals first.

Much more information is needed on whether and to what extent the use of agricultural chemicals results in air pollution before it would be

practical to regulate their use intelligently under the Clean Air Act. Further, most of the agricultural chemicals included in the list of hazardous air pollutants in §.816 have not been shown to be air pollutants.

Congress and EPA need to understand the unique difficulties involved in controlling any air pollution that may result from use of agricultural chemicals. The control measures would differ greatly from those used to reduce emissions from other industrial or commercial operations. The control of potential air pollution from agricultural chemicals, therefore, would entail the weighing of factors not normally considered in formulating regulations under the Clean Air Act. These factors need to be studied more thoroughly.

Cotton producers think that FIFRA could be used to regulate air pollution problems that may result from pesticide use. They think that EPA's Office of Pesticide Programs should be directly involved in any regulation of pesticide use, because of that Office's expertise and because any changes in product composition or labeling will have to involve use of FIFRA.

The major source definition -- those emitting ten tons of a single listed chemical or 25 tons of a combination of listed chemicals -- should be raised, otherwise many small businesses who really are not major sources of potentially toxic chemicals will be severely economically impacted.

Requiring all major sources to adopt Maximum Achievable Control Technology (MACT), regardless of need, would be unrealistically burdensome and expensive as well as not technologically and economically feasible. MACT needs to be realistically defined.

The air toxics portion of the amended clean air act, rather than trying to control all chemical emissions, should address those chemicals which are the most toxic and pose the greatest health risk to the largest number of people.

Non-attainment: Cotton producers are concerned about the potential for overlapping or inconsistent regulation of agricultural chemicals under the air toxics and non-attainment proposals before Congress.

Cotton producers believe that in addressing non-attainment problems in urban areas, it will be more effective to regulate pollution from urban source before regulating non-urban activities such as agricultural chemical use.

The impact of the non-attainment control provisions could vary significantly depending upon what criteria EPA is instructed to use to select categories for regulation; what level of controls apply (e.g., reasonably available controls versus lowest feasible emission rate); and on whom the regulations fall (e.g., manufacturers versus end-users).

The requirements for the Administrator to promulgate control technique guidelines for emissions from area sources which cause or contribute to PM-10 non-attainment do not provide enough time. In some areas the major sources of PM-10 are fugitive dust from unpaved roads, etc., and not from industrial operations.

Permits and Enforcement Provisions: The permit program will pose major problems for all. Only direct costs, not indirect costs, of developing and administering the permit program should be assessed all facilities. Permits should be issued for a fixed period of not less than of 5 years and preferably ten years, given the complex permit system proposed.

Appropriate enforcement actions against violators of the law are necessary, but a \$10,000 daily fine for any permit violation is excessive and unnecessary. Enforcement actions should be taken against intentional polluters, not against those who err by unintentionally failing to maintain all of the compliance records.

Semi-annual or more frequent progress reports to the permitting authority are not necessary or appropriate.

Conclusion

In summary, any Clean Air Act legislation passed must allow a strong and healthy manufacturing and agriculture economy to be maintained in addition to improving the nation's air quality. NCC and NCGA urge that the subcommittee consider our concerns and modifications accordingly, whatever legislation is approved. NCC appreciates the opportunity to submit these concerns and would be happy to further discuss this important issue with the subcommittee or full committee.

COMMENTS OF NISSAN RESEARCH & DEVELOPMENT, INC.,
ON THE CLEAN AIR ACT AMENDMENTS

SUBMITTED TO THE
SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION
COMMITTEE ON THE ENVIRONMENT AND PUBLIC WORKS

U.S. SENATE

OCTOBER 20, 1989

I. INTRODUCTION

Nissan Research & Development, Inc., headquartered in Plymouth, Michigan, is the design and development subsidiary of Nissan Motor Company, Ltd. of Tokyo, Japan. We are an independent, wholly owned subsidiary at work using American engineers to design passenger vehicles for the U.S. market.

Nissan appreciates the opportunity to present our views on clean air issues in general, and S. 1490 and S. 1630 in particular. These comments address those portions of the legislation that affect passenger vehicles and light-duty trucks, and the manufacture of those vehicles by Nissan's U.S. manufacturing subsidiary.

Nissan is proud of the efforts we have made in reducing the emissions levels of our vehicles over the past 20 years, and we are continuing to devote significant energy toward development of new technologies that will allow us to achieve even greater reductions. Attached to these comments are comments we recently submitted to the California Air Resources Board, which describe in detail some of the technological advances Nissan has already incorporated into production vehicles, as well as technologies still under development (Attachment I)*. Nonetheless, we believe that the vehicle standards and accompanying provisions in S. 1630 present serious questions of technological feasibility. Our opinion is that S. 1490 achieves a better balance between environmental and economic considerations than does S. 1630. Even though the emissions reductions in S. 1490 will require considerable effort and will be costly, we support its reductions as stringent yet more realistic goals.

Attachment I has been retained in committee files.

II. MOBILE SOURCE CONCERNS

TAILPIPE STANDARDS

The standards proposed in S. 1630 are beyond Nissan's current technological capability. At the outset, the relationship between certification and in-use levels needs to be examined. One cannot take certification data and predict ability to meet in-use standards.

As an example, Nissan has analyzed hydrocarbon (HC) emissions from some of our 1984 vehicles. The average assembly-line emissions from those vehicles was 0.144 gram/mile. From that, one might (incorrectly) surmise that Nissan could meet a 0.31 gram/mile total HC standard, or, with a little extra effort, even a 0.125 standard. Yet in-use data on those vehicles from EPA and CARB surveillance data shows average emissions close to the current 0.41 gram/mile standard (0.386 gram/mile total HC). Thus, although our current certification and assembly-line emissions are well below the current standard, that margin is essential to ensure compliance with standards in-use for 50,000 miles. To comply with a 0.31 gram/mile standard for 50,000 miles, assuming the same deterioration as above, could require an assembly-line emissions target as low as 0.068 gram/mile.* A requirement to meet such a standard up to 100,000 miles would require even a lower assembly line emissions target. We know of no proven and reliable current technology that would permit us to achieve such a low level of HC at certification or on the assembly-line. A 0.125 gram/mile total HC standard is yet one more step beyond the feasibility of any technology we have projected.

* This assembly line emissions target is determined by subtracting in-use deterioration taken from 1984 model Nissan vehicles from the emissions standard (i.e., $0.31 - [0.386 - 0.144] = 0.068$).

Please note, we do not understand completely the causes of in-use deterioration or how to reduce this deterioration. Some have argued that deterioration is proportional to the standards.

Thus, for a standard of 0.31 gram/mile HC, the in-use deterioration value would be as follows: $(0.386 - 0.144) \times 0.31 / 0.41 = 0.183$

This deterioration, if correct, would establish an assembly line target of 0.127 gram/mile HC (in other words, $0.31 - 0.183$, rounded off).

Since we do not know what causes in-use deterioration, we believe it is appropriate to use an empirical value for in-use deterioration in the attached figure, rather than a calculated proportional in-use deterioration value.

Notably, the above analysis of certification to in-use levels assumes deterioration rates as experienced by the 1984 example vehicles. We do not purport to fully understand the causes of deterioration, or how to control that phenomenon. Yet, there is reason to believe that deterioration rates in the future, especially if associated with more stringent standards, could be exacerbated. Deterioration tends to worsen with increased temperatures. Increased highway speeds increase operating temperatures, and thus may cause more rapid deterioration. Moreover, to the extent that other catalyst types, such as pre-catalysts or manifold catalysts, may be needed to meet more stringent standards, operating temperatures tend to increase. Furthermore, EPA data show that the imposition of new standards causes a decrease in in-use compliance rates, and that as emission standards remain stable, vehicle compliance rates improve (Zinger, "Emissions Performance of Properly Maintained Vehicles", SAE No. 851262).

The tradeoff between standards, and between standards and fuel efficiency and performance also needs to be considered. The greater the control of oxides of nitrogen (NO_x), the more difficult it is to control HC and carbon monoxide (CO), which is why it is misleading to look to California as an example of existing NO_x control capability (California's current CO standard is less stringent than the Federal standard). Proposed NO_x levels of 0.4 gram/mile and 0.2 gram/mile would likely require adjustments in the ignition timing, air/fuel ratio, and particularly, increased exhaust gas recirculation (EGR). These adjustments tend to degrade fuel efficiency and impair driveability.

We believe that members of the Committee may be aware of test data recently made public by the California Air Resources Board (CARB) for average in-use emissions of 1987 Sentras recently tested by CARB. Those data show very good emissions performance, including an average non-methane hydrocarbon (NMHC) level of 0.105 gram/mile (this rounds to 0.11 gram/mile). However, Nissan does not believe that these test results indicate that the standards in S. 1630 are technologically feasible, for the following reasons.

First, these vehicles were tested at an average mileage of 36,400 miles. The requirement in S. 1630 is that emissions remain below the standards (0.25 gram/mile NMHC at Tier I and 0.125 gram/mile total HC at Tier II) at 100,000 miles. Our current light-duty vehicles are designed so as to comply with the emission standards at 50,000 miles and we cannot predict that these vehicles will comply with the proposed standards at 100,000 miles.

Indeed, using available extended mileage data, we can project that emissions of the 1987 Sentra vehicles would increase after 36,400 miles. The extended mileage data that we have is 120,000-mile durability data from our light-duty trucks (see Attachment II). These data indicate that the emission control systems deteriorate after 50,000 miles even under certification conditions. This is the absolute minimum deterioration that can be expected. According to our experience, however, actual in-use deterioration is always greater than certification deterioration.

There is also limited data beyond 50,000 miles from EPA's emission factor program. These data also indicate that HC emission performance after 50,000 miles deteriorates (see Attachment III). Finally, we also have examined EPA emission factors and surveillance data for certain Nissan vehicles (see Attachment IV).

Thus, we can project in-use deterioration to 100,000 miles by using this light truck certification data and the EPA in-use data. The certification data shows the minimum deterioration that would be expected, while the emission factors data shows more realistic in-use deterioration (see Attachment V). Nissan prepared three separate projections of in-use emissions based on the data sources described above: Projection #1 represents emissions using the light truck certification deterioration factors; Projection #2 represents emissions using the average deterioration of all manufacturers' 1983-86 MY 3-way catalyst systems tested in EPA's emission factors program; and Projection #3 represents emissions using the deterioration of 1984 and 1985 Nissan Sentra and Pulsar vehicles tested in EPA's emission factors and surveillance programs. The projected emissions are shown in Attachment V along with the requirements of S. 1630, and current Federal and California requirements. Based on any of these data sources for emissions beyond 50,000 miles, the projected 100,000-mile emissions of the 1987 Sentra vehicles tested by CARB exceed the standards required in S. 1630, as shown in Attachment VI.

Second, the average CO value for these vehicles was 4.67 gram/mile. This exceeds the current Federal CO standard of 3.4 gram/mile (see Attachments V and VI). It should be noted that the current California standard for CO is 7.0 gram/mile. S. 1630 would require that CO be controlled to 3.4 gram/mile in Tier I and 1.7 gram/mile in Tier II. Nissan has essentially maximized CO control with catalyst technology, so that further catalyst improvement will be necessary to reduce CO. However, we have not yet reached any technical breakthrough to comply with these standards. The other CO control option is a leaner fuel mixture. But generally, enleanment will result in driveability problems that will make vehicles unacceptable to our customers.

Third, this data is for only one engine family, whereas in 1987 MY, we certified 20 engine families. We cannot predict that other engine families would achieve the same low HC emissions as the 1987 California Sentra.

Again, even if we could further reduce HC and CO emissions for this or other engine families, we do not know how to control deterioration at extended mileage with sufficient confidence to predict compliance with the standards proposed in S. 1630.

Nissan also believes that the risk of setting standards that are impracticable is a risk that goes to the heart of the emission control program. Efforts to meet standards with insufficient leadtime in the early 1970's led to impaired vehicle performance and the public belief that vehicle emission controls were associated with poorly performing vehicles. The result was widespread emission control tampering, which persisted long after most performance problems were remedied by the manufacturers. For example, EPA found in a 1984 survey that nearly one quarter of 1975 to 1984 model year vehicles showed evidence of emission control tampering. EPA also reported that the effects of the tampering could be as great as a 500 percent increase in HC emissions due to catalyst removal, an 800 percent increase in CO emissions due to air pump tampering and a 175 percent increase in NO_x emissions due to EGR tampering. By again effecting a rapid reduction in emission without breakthrough technology, there is the risk that the anticipated marginal improvements will result in the conditions that spawned distrust of emission controls, associated emission control tampering, and no actual gain in emissions reduction.

By contrast, S. 1490, the Administration clean air bill, sets stringent yet more reasonable standards in-use, and, by permitting a phase-in of the new standards, provides a more reasonable time frame that will permit more orderly development of the technology required to meet lower standards. Nissan supports such an approach and believes it will result in less of the counter-productive effects described above for overly-stringent standards.

COLD TEMPERATURE CO

Nissan has not developed any technology to date that would permit compliance with the cold temperature CO requirements of S.1630. The time period from engine start until catalyst light-off and until the fuel mixture goes from the richer starting mixture to stoichiometric, (i.e., that time period before vehicle emission controls are completely effective), is longer at temperatures below the 68-86 degrees F. of the Federal Test Procedure. Thus, higher tailpipe CO is emitted during that period and, as a result, over the driving cycle. Also, it is more difficult for heavier vehicles to comply with the cold CO standard. While we are working with EPA on its program to control cold temperature CO, we have not achieved any technological breakthroughs that would make feasible the kinds of levels contained in the legislation.

In addition, whereas S. 1630 requires 100% of a manufacturer's fleet to meet the cold temperature CO standard in the first year it takes effect, S. 1490 at least permits a phase-in of the standard.

ONBOARD REFUELING CONTROL

To develop the technology necessary for safe and acceptable onboard refueling controls will require considerable effort, particularly in the areas of safety, durability, driveability, space utilization, and emissions synergistic efforts (i.e., rapid purge of refill vapors requires increased HC control). Nissan believes that a minimum of four years leadtime to begin the phase-in of onboard would be required.

The effect of onboard controls on feasibility of tailpipe standards needs to be considered. We anticipate the need to develop a new purge system to meet an

onboard requirement, such as a variable orifice purge. However, even with development of new purge systems, tailpipe emissions performance will tend to worsen (especially HC), rendering compliance with more stringent tailpipe standards more problematical.

The additional parts and sheet metal changes required for onboard systems affect crash deformation, through which compliance with safety requirements is largely measured. Nissan would need to analyze the effects of changes on each model to establish safety compliance. We would expect that any additional risk could be reduced or minimized (as would be our goal) with sufficient lead time. We are pleased that the House Subcommittee on Health and the Environment has properly recognized the importance of minimizing the safety risk associated with onboard by requiring EPA to determine in consultation with the DOT that onboard systems are indeed safe prior to promulgating an onboard requirement. In fact, the National Highway Traffic Safety Administration recently released a study that strengthens the auto industry's contention that onboard controls pose potential safety risks (Arthur D. Little, Inc., "An Assessment of Key Safety Issues Associated with Onboard Vapor Recovery Systems," June, 1989/Reference 61226).

Nissan estimates that onboard controls will cost our customers \$84 to \$114 per vehicle, assuming adequate leadtime and a phase-in are permitted. Because there exists methodology, Stage II vapor recovery systems, to address refueling losses in a manner that is both specific to those areas with ozone nonattainment problems and that can achieve effective control without awaiting vehicle fleet turnover, the advisability of incurring onboard control costs should be given careful consideration. It is interesting to note that California has adopted a new ozone reduction plan that does not include onboard controls even though the Clean Air Act permits the state to adopt them. California reviewed its existing controls (including its Stage II controls) and the potential benefits of new ones in drawing up its plan. The fact that the state did not adopt onboard controls is evidence that Stage II is both effective and accepted by the public.

USEFUL LIFE

A 10 year/100,000 mile useful life for light-duty vehicles would render even less attainable the tailpipe standards contained in S. 1630, due to in-use deterioration.

We have no data on 100,000 mile deterioration that would allow us to predict at what levels vehicles would have to certify in order to meet more stringent standards. We note, however, that as a vehicle ages and changes ownership, there are factors over which the manufacturer has no control that affect emissions performance, such as poor maintenance, tampering, and the cumulative effects of poor fuel quality.

S. 1490, by contrast, would impose more stringent tailpipe standards than current law, but retain the existing useful life standards. While we still have a major task to meet standards more stringent than those currently in effect, the retention of the existing useful life standard helps us to manage the greater burden.

LIGHT-DUTY TRUCK EMISSION STANDARDS

S. 1630 and S. 1490 also take different approaches to emission standards for light-duty trucks (in Nissan's case, those under 3,750 pounds GVWR). Current clean air law recognizes that there are differences in the weight, operating conditions and performance requirements of passenger cars and light trucks by permitting a less stringent standard for light trucks. S. 1490 continues to recognize the inherent difference, whereas S. 1630 would establish identical emission standards for passenger cars and light trucks. The severe standards set in S. 1630 are thus doubly infeasible for light trucks.

CHANGE IN FEDERAL TEST PROCEDURE

The current emission standards, and, in effect, the proposed standards, are premised on the FTP as currently constituted. If the test procedures changes, the accumulated data on emissions performance and feasibility becomes meaningless, and, thus, an entirely different basis for setting standards would need to be developed.

CARBON DIOXIDE STANDARDS

Nissan is proud of the efforts we have made in implementing technologies to improve fuel efficiency and, thus, to lower levels of carbon dioxide emissions. However, we know of no currently available or planned technology that would permit us to comply with the levels set forth in S. 1630, under any mix of vehicles

than we envision selling. Since the proposed standards are, like the current corporate average fuel economy standards, based on a sales-weighted average for each manufacturer, compliance is determined in large part by factors beyond the manufacturer's control, such as fuel prices and customer preference. Thus, even if technology were available to meet these levels on particular vehicle models, it would be difficult, if not impossible, to project consumer purchasing trends with any degree of certainty. Moreover, other regulatory requirements adversely affect fuel economy; we have estimated that a 0.4 gram per mile NOx standard and an onboard vapor recovery requirement, coupled with safety requirements (for example, passive restraints and side impact protection) that add to vehicle weight, will result in a fuel economy penalty for Nissan vehicles. Under current law, DOT is required to consider the effects of other motor vehicle regulations when establishing fuel economy standards for motor vehicles.

However, a fleet average carbon dioxide standard, as proposed in S. 1630, is a fairer approach than the manufacturer-specific percentage improvement approach contained in several of the pending bills that address fuel economy (which also is influenced by factors outside of a manufacturer's control, such as fuel prices and customer preference).

III. STATIONARY SOURCE CONCERNS

Nissan Motor Manufacturing Corporation U.S.A. (NMMC), is the manufacturing subsidiary of Nissan Motor Company, Ltd. of Japan. NMMC produces Nissan Sentra passenger cars and pickup trucks in facilities located in Smyrna, Tennessee. We currently employ almost 3,300 employees and produce 240,000 units annually. In April, 1989, we announced plans to boost production capacity to 440,000 units and add a third model to our production line in 1992. This expansion will add approximately 2,000 new jobs in the state of Tennessee.

Nissan has a most serious concern about one stationary source provision in particular. The problem affects Nissan's ability to go forward with these expansion plans. It is possible to read both S. 1490 and S. 1630 to conclude that, not withstanding the fact that we have been granted a construction permit for the new facilities, we will not be issued an operating permit to begin production. This could jeopardize our expansion plans.

The problem arises, one, because under the proposed legislation, Rutherford County, where our facilities are located, would likely become part of a Metropolitan Statistical Area-wide nonattainment area, although the county itself is in attainment; and two, S. 1490 and S. 1630 rely on actual emissions rather than allowable emissions to determine whether to apply new source reviews to modifications of existing operations and to require additional volatile organic compound reduction targets and thus offsets. Nissan's construction permit takes into account the level of emissions from the plant once the new facilities are fully operational sometime after 1992. Between the start of construction and the time the plant is operating at capacity, actual emissions will naturally be much lower than allowable emissions. But it will be during the start up period that the bill would require the state to conduct an emissions inventory, based on actual emissions, to determine the baseline that will dictate future emissions reductions.

Thus, despite the fact that we have a construction permit, indeed a permit that requires Lowest Achievable Emissions Reductions (LAER), we could be required to achieve further emissions reductions through additional controls or obtain offsets to do what our existing permit already authorizes. That could be prohibitively expensive or infeasible.

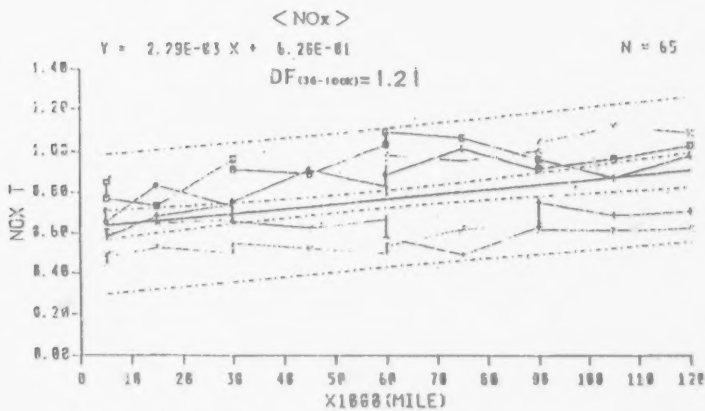
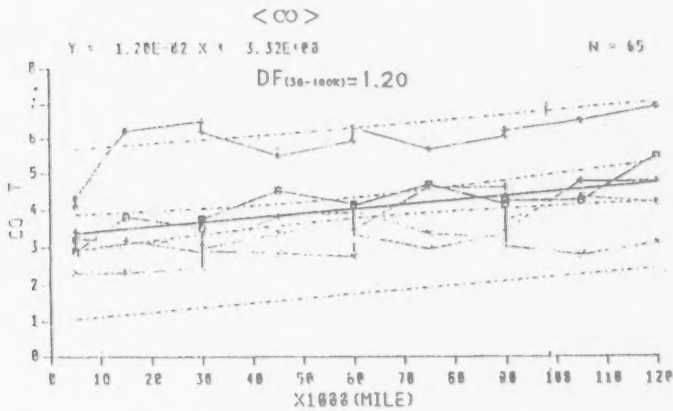
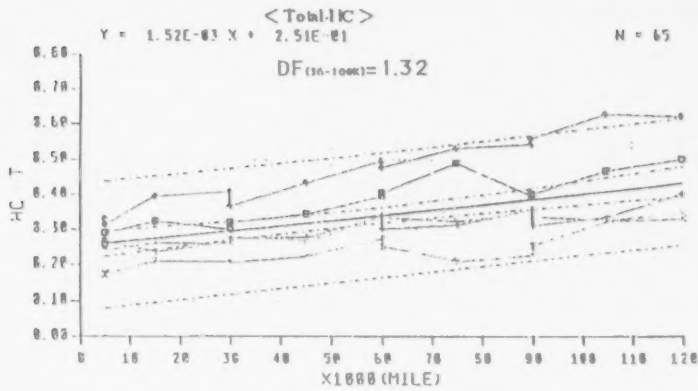
IV. CONCLUSION

Nissan will continue to strive to improve the emissions capability of its vehicles. The auto industry has played a significant role in improving air quality. Since 1970 (pre-control levels), the industry has reduced HC and CO tailpipe emissions by 96%, and NOx emissions by 76%. Nissan recognizes that further reductions will require considerable effort and will be costly and we support the goal of cleaner air for this country.

We believe the requirements of S. 1490 pose more realistic goals than those in S. 1630, and achieve a better balance between environmental and economic considerations. By avoiding overly stringent standards such as those set in S. 1630, S. 1490 could also result in greater, rather than lesser, air quality improvements. S. 1490 also permits less hurried development

and recognizes the critical differences between certification and in-use emission levels. Even though the emissions reductions in S. 1490 will require considerable effort and will be costly, we support its reductions as stringent yet realistic goals.

LDI CERTIFICATION DURABILITY DATA ('88~'90)



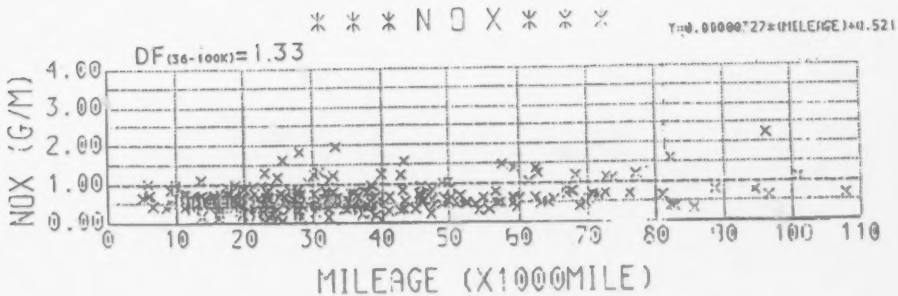
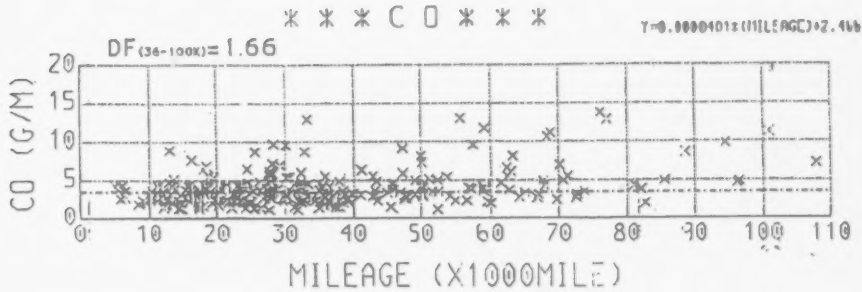
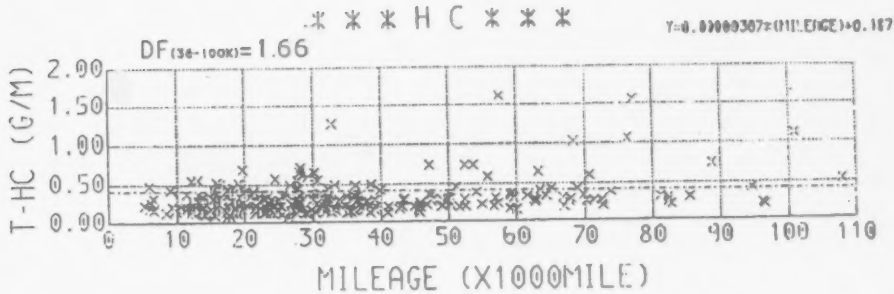
ATTACHMENT III

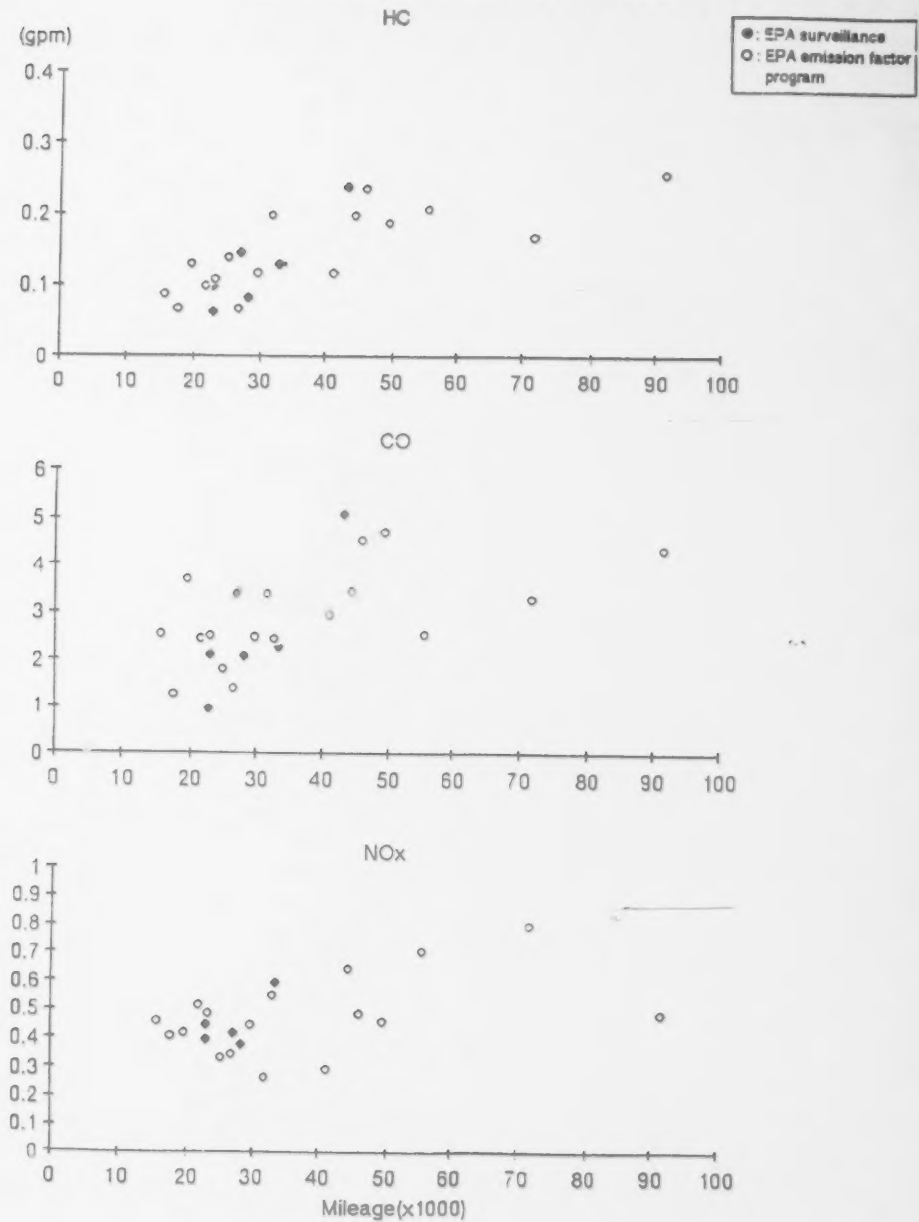
IN-USE VEHICLES EMISSION

(1983 - 1986MY FEDERAL 3WAY-CATALYZER)

EMISSION FACTOR PROGRAM DATA N=205

EVERY MANUFACTURE'S DATA INCLUDED



IN-USE VEHICLE EMISSION
(1984-1985MY FED SENTRA/PULSAR)

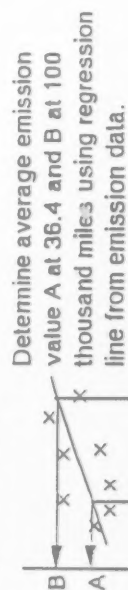
'87MY SENTRA ARB ENFORCEMENT TEST RESULTS(N=10) gpm

NM-IIC	T-IIC	CO	NOx	Distance
0.105	0.135	4.67	0.261	36,400 miles
0.39	0.41	7.0	0.7	Applicable California standards
----	0.41	3.4	1.0	Current Federal standards

100,000 MILES EMISSION PROJECTION

Deterioration	No.	DF(36-100k)				Projected 100k Emissions (gpm)				Remarks
		HC	CO	NOx		NM-HC	T-HC	CO	NOx	
Certification	#1	1.32	1.20	1.21		0.138	0.178	5.622	0.315	'88 ~ '90 LDT(N=5)
In-Use Emission Factor Program	#2	1.66	1.66	1.33		0.174	0.224	7.731	0.347	'83 ~ '86 Fed LDV All Mfr's Data (N=286)
In-Use Emission Factor Program & Surveillance	#3	2.06	1.76	1.48		0.216	0.278	8.194	0.386	'84, '85 Fed Nissan Sentra & Pulsar (N=23)

Projection Procedures



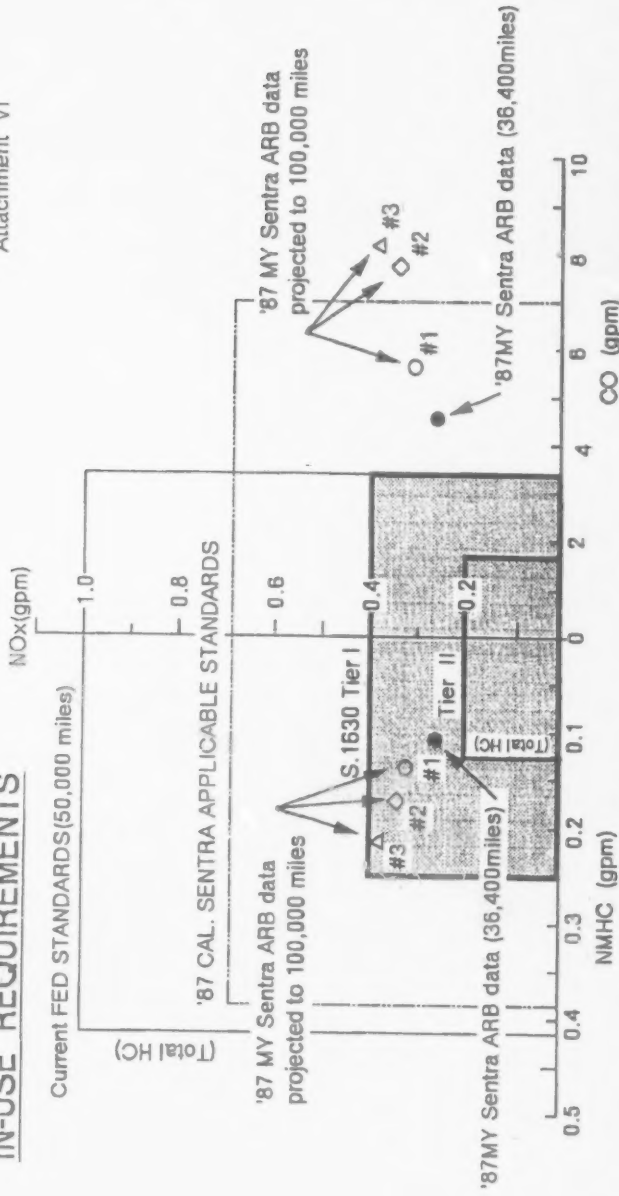
$$DF = B/A$$



$$E_{100k} = E_{36.4k} \times DF$$

IN-USE REQUIREMENTS

Attachment VI



The hatched boxes show the requirements of S. 1630. If a vehicle's emission values all fall within a box, then the vehicle would comply with the requirements represented by that box. A similar box is shown for the California standards that apply to the 1987 model Sentra vehicles. A box is also shown for the current 50,000 miles Federal standards.

We can see that the in-use testing data for the 1987 model is within the California box, but the CO value is outside of the S. 1630 box, as well as the current Federal standards box. If we project the data for the 1987 models to 100,000 miles, the CO data point moves even further outside of the S. 1630 boxes. This illustrates the amount of in-use deterioration that must be overcome to ensure compliance.

WRITTEN TESTIMONY OF

MR. RONALD KRUMM

VICE PRESIDENT OF MARKETING

POLAR MOLECULAR CORPORATION

PREPARED FOR THE

SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION

WASHINGTON, D.C.

September 29, 1989

On behalf of the Polar Molecular Corporation (PMC) I greatly appreciate the opportunity to provide this written testimony to the Senate Subcommittee on Environmental Protection concerning S. 1630, the "Clean Air Restoration and Standards Act of 1989." I welcome this chance to submit some comments and observations about this important legislation for your consideration.

By way of background, PMC is an independent Saginaw, Michigan-based firm which has developed a series of motor fuel and petroleum product additives to improve combustion and fuel flow characteristics. Several products developed and patented by PMC, such as DurAlt^R Fuel Conditioner (FC), have been proven in independent tests to reduce engine deposits and exhaust emissions while improving fuel economy in gasoline and diesel. PMC has developed other products to improve the performance of engine fuels. As a member of the Clean Fuels Development Coalition (CFDC), PMC fully supports the innovative mobile source proposals of S.1630, especially those which address the issues of motor fuel quality.

DurAlt[®] FC is a several-component mixture containing only carbon, hydrogen, and oxygen. Its active components are a polar material, compatibilizers for the polar material and hydrocarbons, and a compound for enhancing the water tolerance of the product. This product has met EPA's "Substantially Similar" requirements and can be used for the bulk-treatment of unleaded gasoline.

DurAlt[®] FC, which has been extensively tested at EPA-approved facilities and overseas, shows great promise in reducing carbon monoxide (CO) and hydrocarbon emissions from gasoline-powered vehicles and particulate emissions from diesel engines. Used either to bulk treat gasoline and diesel fuel at the terminal or by the consumer at the point of retail purchase, DurAlt[®] FC can provide the necessary cylinder deposit control, valve lubrication, and other qualities which improve the performance of engines, both old and new. Given the fact the older vehicles are responsible for most of the ozone-forming mobile source-related hydrocarbon emissions, DurAlt[®] FC can make a major contribution to reducing emissions from existing, in-use vehicles without unnecessary lead-times.

For example, it is well-known that as mileage accumulates on vehicles, beginning within a few thousand miles of operation, a phenomenon known as "octane requirement increase" (ORI) begins. Because of the incomplete combustion of fuels, deposits form in engine induction systems, fuel injectors, and in combustion chambers. To combat the problem, which leads generally to poor engine performance and "knock," consumers purchase higher octane gasolines which are also more expensive.

Independent tests have concluded that gasolines treated with DurAlt[®] FC can reduce a vehicle's (ORI) by as much as six octane numbers. It does this by modifying the combustion of hydrocarbons in the cylinder during combustion, thereby reducing the products of incomplete combustion such as unburned toxic hydrocarbons, carbon monoxide, and engine deposits. The result: improved engine efficiency and gasoline mileage.

A copy of a paper which more fully describes the technical and performance characteristics of this product which was presented earlier this year before the Society of Automotive Engineers (SAE) and other literature is attached. *

PMC believes that DurAlt[®] FC is a product which precisely fits the definition of additives required under Section 217 of S.1630, as well as the intent of this legislation which is to encourage the use of fuel products to improve air quality.

Among many other mobile source provisions, Section 217 calls for the utilization of improved deposit control additives in gasoline to reduce engine deposits in improve engine performance and thereby reduce harmful tailpipe emissions from automobiles. This provision, along with requiring the expanded use of oxygenated fuels, controls on gasoline volatility, and stricter limits on vehicle emissions (including for the first time carbon dioxide) can lead to substantial improvements in air quality in the coming decade and beyond.

In addition, we believe that the uniform national motor fuel quality provisions of Section 217 are long overdue. The Subcommittee is quite justifiably concerned about motor fuel quality, especially given that S.1630 calls for the final elimination of tetraethyl lead additives from gasoline, a move we fully support. The patchwork quilt of state laws and regulations has made it increasingly difficult for marketers to conduct business, especially given the new environmental imperatives of the 1990s. Adopting fuel specifications established by the American Society for Testing & Materials (ASTM), for example, would go long way toward

I would only point out, however, that a regulatory ambiguity in the existing Clean Air Act can allow some marketers to add non-lead compounds into unleaded gasoline and permit them to market those fuels as leaded. Despite the fact that the Act contains no provision other than prescribing the minimum lead content of leaded gasoline, the U.S. Environmental Protection Agency (EPA) adopted 40 C.F.R. 80.2(f) also defining leaded gasoline as containing more than 0.005 grams per gallon (gr/gal.) of phosphorous, considered a "trace" level.

Attachments to this statement have been retained in committee files.

It is well established that phosphorous additives can impair "to a significant degree," in EPA's words, the emissions control systems on 1975 - 76 or later model vehicle. For convenience, EPA has classified any gasoline containing more than 0.005 gr/gal. as leaded. Because of this, several additive marketers are selling products -- for bulk treatment and/or in for aftermarket sales -- which contain phosphorous. The true anomaly presented by this situation is that these products can be marketed without EPA scrutiny because the fuel waiver provisions of the Clean Air Act are not applicable to leaded gasoline although these products could easily added into the fuel tanks of vehicles designed to operate exclusively on unleaded gasoline. As EPA has determined, such a practice would deteriorate catalysts and lead to increased vehicle emissions.

In the absence of EPA action, several states have independently prohibited the sale of gasoline containing phosphorous compounds. For several years, the states of Florida and Michigan have prohibited the sale of any gasoline containing more than 0.005 gr/gal. of phosphorous, with no adverse effects. Given the potential for real harm which can be caused by phosphorous compounds in gasoline, PMC strongly urges the Subcommittee to consider including a provision which would close this loophole, maintain vehicle catalyst performance, and improve air quality. We therefore recommend that the Subcommittee consider language which would limit the amount of phosphorous in any gasoline -- leaded or unleaded -- to no more than 0.005 gr./gal.

In conclusion, I greatly appreciate the opportunity you have provided to share my observations on S. 1630. It is an excellent, far-sighted legislative initiative which if passed will dramatically improve the nation's air quality well into the next century. PMC is proud that gasoline and diesel fuel additive products such as DurAlt^R FC are included among the ways in which this goal can be accomplished.